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THE PERFORMANCE OF SOCIALIST AGRICULTURE

A Case Study of Production and Productivity
in Czechoslovakia, 1934-38 and 1946-61

By GREGOR LAZARCIK
Columbia University

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1963

OTHER PUBLICATIONS OF THE AUTHOR

Le Conseil de l'Europe: Les Statuts et le But, (The Council of Europe, Its Statutes and Its Task), Memorandum, 1953, the International Law Library, University of Paris, Paris, France, 65 pages.

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Note

The Appendixes including Appendix Tables were not included in this book because of the substantial publishing costs. However, the Appendixes including the text are available on microfilm (\$4.95) and on xerox (\$17.35). Those interested may purchase them from the University Microfilms, Inc., 313 No. First Street, Ann Arbor, Michigan.

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CHAPTER I

INTRODUCTION

A. Purpose and Methodology

1. Purpose

The present study attempts to provide answers to four main questions about the agricultural sector of the Czechoslovak economy during 1934-38 and 1946-61, namely:

- (1) How did different production measures behave during this period?
- (2) What changes occurred in the productivity of land, capital, and labor?
- (3) What were the most significant non-economic and economic influences affecting production and productivity?
- (4) How did Czechoslovak performance compare with that of Western Europe?

Czechoslovak postwar agriculture is of particular interest as an example of economic performance by a socialist economic system in agriculture. Basic structural changes have been made in the whole Czechoslovak economy since the war. In agriculture, ownership and control of the bulk of productive resources were gradually transferred to the state between 1949 and 1961. This study thus provides a comparison between the 1934-38 base period (during which a private-enterprise system prevailed) and the years 1946 to 1961 (during which Czechoslovak agriculture was reorganized into a centrally-planned socialist system). To assure comparability with postwar territorial coverage Carpathian Ruthenia is excluded from prewar data. No description or evaluation of the effect of this reorganization on the economy as a whole is attempted in this study, and no description of the social and political motives and consequences of this reorganization will be offered. Both of these are important, but they are excluded from this essentially statistical study, the aim of which is to report the results of an attempt to measure objectively Czechoslovak performance in only one economic sector--agriculture.

2. Methodology

Much of the data published by different countries on the performance of their economies cannot be used directly for international comparison because the meaning of such data normally differs greatly from country to country.¹

¹For more detailed discussion of this problem see Arthur R. Burns, Comparative Economic Organization, New York, Prentice-Hall, 1955, pp. 6-10.

To improve the international comparability of economic performance data, the United Nations has developed standard concepts of measurement of all economic activities. For agriculture, standard international concepts and techniques for measurement of "output," "production expenses," "gross product," and "net product" were defined for the United Nations by the Economic Commission for Europe and the Food and Agricultural Organization.² These uniform concepts have been adopted by Western European countries, and measures of the economic activity of agricultural sectors in these countries have been published in accord with these standards since 1951.³

To insure the comparability of the statistical series developed in this study with those available for the agricultural sector in other European countries, the standard definitions and methods for classification and presentation developed by the United Nations organs are followed in this study of the prewar and postwar performance of Czechoslovak agriculture.⁴

The results of this study are in the statistical tables. In the following chapters the text accompanying these tables defines in detail the basic concepts and explains the techniques used to arrive at indexes which describe changes in performance of the agricultural sector during the period under study. The following measures of performance in Czechoslovak agriculture were attempted: (1) Total crop and animal production; (2) Agricultural output; (3) Current operating expenses and depreciation; (4) Gross product and net product; (5) Productivity of land and capital; and (6) Productivity of labor and output-input ratio (i.e., "total productivity"). One chapter will be devoted to a discussion of factors affecting production and productivity.

Before attempting to calculate these measures, it is necessary to define the term "agricultural sector" as used in this study. This term is used to refer to economic activities which the United Nations system classifies as "major group 01" in the International Standard Classification of all Economic Activities.⁵

Growing of field crops, fruits, nuts, seeds, vegetables, flowers
both in the open and under glass, tea, coffee, and rubber plantations;

²U.N. Economic Commission for Europe and Food and Agriculture Organization, Agricultural Sector Accounts and Tables, A Handbook of Definitions and Methods, Geneva, December, 1956.

³U.N. ECE/FAO, Output, Expenses and Income of Agriculture in Some European Countries, Third Report, Geneva, 1958.

⁴The official Czechoslovak definition of the agricultural sector differs only slightly from that of the U.N. It includes fishing which is excluded from this study (see Ch.II.D.2).

⁵U.N., Statistical Papers, Series M; No. 4, Rev. 1, New York, 1958, p. 6.

raising of livestock, poultry, rabbits, fur-bearing and other animals, bees; and the production of milk, wool, fur, eggs, honey.

Agricultural, animal husbandry and horticultural services on a fee or contract basis, such as harvesting, baling and threshing, husking and selling, and preparing of tobacco for auctioning; animal shearing, veterinary services, animal hospitals and care centers; pest destroying, spraying, pruning, picking and packing; and operating irrigation systems and rental of farm machinery.

Transportation of farm products are classified in the appropriate [major] group of division 8 (Transport, storage and communication).

The above definition is in terms of the farms, or agricultural production units, supplying these products or carrying on these activities; certain auxiliary functions are included in the agricultural sector as miscellaneous output.⁶ For instance, the services of machine-tractor stations are regarded as activities within the agricultural sector. Farm investment in kind is also included,⁷ but farmers' dwellings are not regarded as part of the agricultural sector. A few agricultural activities (i.e., commercial production of flowers and silkworms) are omitted from consideration in this study because of non-availability of data. The effect of these omissions on the overall results, however, is negligible.

Before we begin the main body of this study, a brief survey of changes in the organization of Czechoslovak agriculture since prewar years is presented in the following section.

B. Survey of Changes in the Organization of Czechoslovak Agriculture since Prewar Years

Agriculture was the second largest sector of the economy after industry in Czechoslovakia. Agriculture was diversified because of the different quality of soil at different altitudes, a climate suitable for many crops, and an existing demand for a large variety of agricultural products.⁸

1. Prewar Conditions

Before World War II, the typical unit of production or farm, in Czechoslovak agriculture was a privately-owned "family" farm. In 1930, there were

⁶For a detailed explanation of items included in miscellaneous output, see Appendix D.

⁷For definition and coverage of farm investment in kind, see Appendix D.

⁸Julius Cihás, ed., Narodohospodarsky atlas republiky Ceskoslovenske, Prague, 1928, pp. C1-C3.

1,530,000 of these units and a few hundred state farms.⁹ The owner, usually the head of a family, assumed the function of manager and entrepreneur on his own farm, and, only seasonally, employed hired labor. Only 1.7 per cent of agricultural land was managed by the state or local government (Table 1, item 15). The surplus labor in agriculture, a common problem of east European countries, existed in Slovakia and Carpathian Ruthenia.¹⁰

Most of the farms were very small in size: in 1930 about 71 per cent of all farms were under five hectares and occupied only 23 percent of total agricultural land. The farmers in this group could not derive a sufficient income from farming; they had to supplement it from other activities (i.e., handicrafts, trade, and hired labor). The medium-size "family" farms were considered between 5-20 hectares and amounted to 25 per cent of all farms and 42 per cent of all agricultural land. This size of farms provided enough work for the farmer and his family the whole year around and supplied an income sufficient to sustain his family. There were only 4.3 per cent of the total farms with 20 hectares and over but their share amounted to 35 per cent of total agricultural land. During the inter-war period, the policy of the Czechoslovak government was to reduce this inequality through land reform, which redistributed the land of large estates to small farmers. However, the land reform was only partially carried out. The share of agricultural land in farms exceeding 100 hectares decreased from 16 per cent before the reform to 10 per cent after the reform (January 1, 1938), and that in farms of 2-20 hectares increased from 58.4 to 65.3 per cent in the same period.¹¹ Thus, agriculture was predominantly a small scale industry with some 44 per cent of all farms and 7.6 per cent of all agricultural land distributed in holdings less than 2 hectares of size at one extreme, and 0.3 per cent of all farms and 10 per cent of agricultural land in farms of 100 hectares and over at the other extreme. Despite the land reform program, the problem of small farms with insufficient capital remained the dominating factor of the country's agricultural policy.

The farmer-entrepreneurs¹² were free to decide what to produce, how to produce, how much to produce, how much to sell, and what to do with the proceeds. On the other hand, a production unit could not influence the prices of

⁹ Distribution of farms according to size in 1930 is given in Table 2.

¹⁰ P. W. Rosenstein-Rodan, Agricultural Surplus Population in Eastern and South-Eastern Europe (mimeo.), Royal Institute of International Affairs, London, 1943-45. This source shows 13 per cent surplus of labor in Czechoslovak agriculture in 1937 concentrated exclusively in Slovakia and Carpathian Ruthenia; the latter region is excluded from this study to assure the comparability with the postwar territorial coverage.

¹¹ Brdlik, op. cit., pp. 36 and 38.

¹² Professor George Stigler in Price Theory (New York, 1952), p. 5, defines entrepreneur as one who buys the productive resources for productive purposes. In my opinion, the owner of productive resources may also be termed an entrepreneur if he engages his resources in productive activity at his own risk. The latter interpretation of entrepreneur is used in this study.

the products it sold or bought because of its limited size.

The ultimate end of farming was to derive the greatest profit and personal satisfaction. However, the cartels of other sectors, such as trade, had a tendency to distort the competitive price system. To counteract this tendency, to provide cheap credit to farmers (credit cooperatives), and to process and store agricultural products (processing and warehouse cooperatives), the farmers organized themselves into a network of agricultural cooperatives.¹³

Government policies influenced the organization of agricultural production in the inter-war period not only through land reform but also by fixing the prices of the main crops through the "grain monopoly" after 1934.¹⁴ As a result, the large land-holders who marketed mostly grain were protected against price declines. Small farmers, who derived their income mostly from the sale of livestock products, remained subject to sharp price changes.¹⁵ Except for controls on the price of grain, the agricultural sector was organized and operated, however imperfectly, along the lines of a "private-enterprise" system.

2. Postwar changes

Since 1945, Czechoslovak agriculture has changed fundamentally: Its share in the contribution to national income has declined greatly; basic shifts have occurred in the allocation of productive resources; the organization of production has undergone important structural changes; and the price system based on market economy has been replaced by managed prices.

Agriculture's contribution to the national income¹⁶ declined from 23¹⁷

¹³For a more detailed discussion of the organization, activity, and effect of agricultural cooperatives, see Ladislav Feierabend, Agricultural Cooperatives in Czechoslovakia (New York, 1952).

¹⁴Marko Weirich, Stare a nove Ceskoslovensko, Prague, 1938-39, p. 120.

¹⁵State Planning Office in Prague, Planovane hospodarstvi, 1954, No. 3, pp. 181-82.

¹⁶Official Czechoslovak definition, similar to that of the Soviet Union, counting only material production and excluding "unproductive" services from the national income (see State Statistical Office, Statisticka rocenka republiky Ceskoslovenske, 1948, Prague, 1958, p. 17. Hereafter referred to as "Stat. roc.").

¹⁷This would imply that the average contribution to national income per man-year in agriculture was only slightly more than one-half of that in the rest of the economy, since the share of the agricultural labor force was almost twice as large (Table 1, item 13) as its share of the national income. This would indicate a lower product per unit of labor in agriculture than in the rest of the economy because the amount of capital per man is smaller in agriculture (see Stat. roc. 1957, p. 292).

Table 1

SELECTED INDICATORS OF CHANGES IN CZECHOSLOVAK AGRICULTURE, 1934-38
AVERAGE AND 1946 - 61*

I t e m s	1934-38 <u>average</u>	1946 <u> </u>	1947 <u> </u>	1948 <u> </u>	1949 <u> </u>	1950 <u> </u>
1. Agricultural land, thousand ha., beginning of the year	7,756	7,537	7,427	7,561	7,548	7,514
2. Index of agricultural land	100	97	96	97	97	97
3. Index of area sown in grain and pulses	100	87	86	89	84	81
4. Index of area sown in oil and industrial crops	100	136	133	128	139	151
5. Index of number of cows, Jan. 1	100	86	85	78	78	82
6. Index of number of pigs, " "	100	75	94	82	103	134
7. Index of number of horses, " "	100	99	100	96	96	96
8. Tractors, thousand units	6	12	16	22	27	28
9. Index number of tractors	100	207	281	386	474	491
10. Index of value of machinery and equipment, in 1956 prices	100	113	113	114	116	119
11. Persons permanently employed, thousands	2,426	2,291	2,157	2,244	2,152	2,063
12. Index of permanently employed	100	94	89	92	89	85
13. Percentage of labor force in agriculture	37	39	39	40	39	38
14. Agricultural land per permanently employed, ha.	3.2	3.3	3.4	3.4	3.5	3.6
15. Percentage of total agric. land in state and public farms	1.7	..	..	8.0	9.4	10.7
16. Percentage of total agric. land in collective farms	-	-	-	-	0.1	15.4
17. Percentage of total agric. land in private farms	98.3	..	..	92.0	90.5	73.9
18. Investment in agriculture and forestry, million crowns in 1957 prices	..	..	..	..	871	1,201

*For sources and explanatory notes see Notes to Table 1.

	<u>1951</u>	<u>1952</u>	<u>1953</u>	<u>1954</u>	<u>1955</u>	<u>1956</u>	<u>1957</u>	<u>1958</u>	<u>1959</u>	<u>1960</u>	<u>1961</u>
1.	7,506	7,474	7,455	7,215	7,292	7,414	7,377	7,336	7,389	7,362	7,327
2.	97	96	96	93	94	96	95	95	95	95	94
3.	78	79	79	76	77	78	78	77	76	74	74
4.	180	180	183	166	171	171	169	175	184	182	185
5.	87	90	93	90	88	87	87	87	87	87	86
6.	121	135	156	133	152	168	171	173	168	181	190
7.	92	87	85	83	83	83	83	79	70	59	50
8.	31	33	35	38	42	48	54	62	74	94	116
9.	543	572	618	672	733	836	941	1,087	1,303	1,654	2,027
0.	122	127	119	125	133	140	144	143	147	161	175
1.	1,927	1,855	1,862	1,903	1,937	1,898	1,827	1,764	1,623	1,468	1,380
2.	79	76	77	78	80	78	75	73	67	61	57
3.	34	33	33	33	33	31	30	29	27	24	22
4.	3.9	4.0	4.0	3.8	3.8	3.9	4.0	4.2	4.6	5.0	5.3
5.	10.8	13.5	13.7	15.1	15.5	16.7	17.3	18.2	19.4	20.3	22.1
6.	17.9	32.2	28.8	26.3	26.4	30.5	47.3	58.7	65.1	66.9	65.6
7.	71.3	54.3	57.5	58.6	58.1	52.8	35.4	23.1	15.5	12.8	12.3
8.	1,914	1,939	2,516	2,532	3,419	4,378	4,663	5,656	6,939	7,764	8,360

Sources to Table 1:

Item 1: For 1934-38 and 1948 to 1957, Stat. roc., 1957; p. 111; for 1946, Stat. Digest, 1948, p. 44; for 1947, Zpravy, 1948, No. 37-41, p. 265; for 1958-61, Stat. roc., 1962, p. 228.

Item 2: Item 1 expressed in relatives.

Items 3-4: From Table A-5, items 2 and 9, respectively, expressed in relatives.

Items 5-7: From Stat. roc., 1957, p. 133, and ibid., 1962, p. 244.

Items 8-9: From Table A-23, items 1 and 10, respectively.

Item 10: From Table A-24, item 3.

Item 11: For 1934-38 (the data refer to December 1, 1930, instead 1934-38), Stat. roc., 1937, pp. 20-21; for 1946, derived from 1947 on the assumption that the employment changed in the same proportion as the total population between these two years, or 6.2 per cent (ibid., 1957, p. 47); for 1947 (as of May 22), for Czech regions, Zpravy, 1948, No. 50-53, pp. 366-367, for Slovakia, ibid., p. 362 (the source includes 34,715 persons employed in forestry and fishery, which were subtracted -- see Prubeh, 1948, p. 256); for 1948 to 1957, Stat. roc., 1958, p. 89 (the data refer to average yearly employment); for 1958-61, ibid., 1962, p. 113.

Item 12: Item 11 expressed in relatives.

Item 13: Calculated from number of permanently employed in agriculture (item 11), and the total labor force in the economy obtained from the same sources as the number of permanently employed in agriculture (item 11).

Item 14: Calculated from total agricultural land (item 1) and number of permanently employed (item 11).

Item 15 and 17: For 1934-38 average the agricultural land of state and public farms amounted to 130,000 hectares (the data refer to 1935-36 average, ibid., 1937, pp. 63 and 65, and ibid., 1938, pp. 54 and 56) or 1.7 per cent of the total agricultural land; for 1948, Stat. zpravy, 1958, No. 10, p. 25 (the data refer to arable land at the end of the year); for 1949, for the state and public farms obtained by interpolation of 1948 and 1950 data, for the collective farms, Stat. obzor, 1957, No. 10, p. 474; for 1950 and 1951, Stat. roc., 1957, p. 112; for 1952-57, from ibid., 1958, p. 192; the share of private farms is obtained as a residual. The figures for 1948-61 refer to the end of each year. The corresponding data in the above sources refer to the beginning of the following year; for 1958-61, ibid., 1962, p. 229.

Item 18: Ibid., 1958, p. 99, for 1949-57; for 1958-61, ibid., 1962, p. 128 (adjusted to 1957 prices).

Table 2

DISTRIBUTION OF FARMS AND AGRICULTURAL LAND ACCORDING TO SIZE OF FARMS*

Size of Farm in Hectares	(1)	N u m b e r o f F a r m s				A g r i c u l t u r a l L a n d i n F a r m s			
		T h o u s a n d s		P e r c e n t a g e D i s t r i b u t i o n		P e r c e n t a g e D i s t r i b u t i o n		P e r c e n t a g e D i s t r i b u t i o n	
		1949	1957	1960	1930	1949	1957	1960	1930
1. Under 2	679	695	1,216	1,413	44.4	46.3	78.0	89.2	6.7
2. 2 - 4.99	404	351	191	104	26.4	23.4	12.2	6.6	16.3
3. 5 - 9.99	240	255	103	40	15.7	17.0	6.6	2.5	19.9
4. 10-19.99	141	159	31	9	9.2	10.6	2.0	0.6	22.0
5. 20-99.99	61	38	4	3	4.0	2.5	0.3	0.2	20.8
6. 100 and over	5	4	14	15	0.3	0.3	0.9	0.9	14.3
7. Total	1,530	1,502	1,559	1,584	100.0	100.0	100.0	100.0	100.0

*Sources: Cols. 1, 5, 9: Stat. roc., 1935, pp. 44, 48, 49, 51; forestry, and figures for Carpathian Ruthenia are excluded.
 Cols. 2, 6, 11: Stat. zpravodaj, 1950, No. 2, p. 46; the figures in this source include forestry which was excluded, see. Stat. roc. 1958, p. 191.
 Cols. 3, 7, 12: Ibid., p. 194, and Zemedelska ekonomika, 1959, No. 1 (Supplement), p. IV.
 Col. 10: Vladislav Brdlik, Die sozialekonomische Struktur der Landwirtschaft der Tschechoslowakei, Berlin, 1938, pp. 38, 98.
 Cols. 4, 8, 13: Stat. roc., 1960, p. 222, and Zem. ekon., 1960, No. 5 (Supplement), p. II.

per cent in 1937¹⁸ to 20 per cent in 1948 and to 13 per cent in 1961¹⁹ in current prices. According to the United Nations concept of national income²⁰ used by non-Communist countries, the share of agriculture, amounted to 18 per cent in 1948, and to about 15 per cent in 1956,²¹ in current prices. The decrease in the relative share of national income originating in agriculture was due to greater growth of other sectors (i.e., industry, construction, transportation).²² In constant prices, the net product of agriculture valued in 1948 constant crowns declined by 25 per cent between 1934-38 and 1961 (Table 16, item 17). The absolute decline of net product was caused by quickly increasing inputs into agriculture from other sectors,²³ while agricultural output did not attain the prewar level until 1958.²⁴

Although the agricultural output was stagnating, the demand for food has been steadily increasing since World War II. The population of Czechoslovakia decreased from 14.4 million in 1937, to 12.2 million in 1947,²⁵ because of the transfer of Sudeten-Germans in 1945-46, but it rose again to 13.8 million in 1961,²⁶ due to a natural increase amounting to 1 per cent per year on the average. Rapid industrialization, especially in Slovakia, created an increased demand for food in growing urban and industrial areas.²⁷

In addition, there was constant pressure by consumers to obtain more high quality food. According to official sources, per capita consumption of meat increased from 34 kilograms in 1936, to 57 kilograms in 1961, of eggs from 138 to 180 eggs, and that of bread grain decreased from 171 to 167 kilograms.²⁸ This divergent movement of demand for and supply of agricultural

¹⁸Ministry of Foreign Trade, Czechoslovak Economic Bulletin, 1952, No. 238, p. 13.

¹⁹Stat. roc., 1962, p. 43.

²⁰U.N. Statistical Office, A System of National Accounts and Supporting Tables, Studies in Methods, Series F, No. 2 (New York, 1953).

²¹Thad P. Alton and Associates, Czechoslovak National Income and Product, 1947-48 and 1955-56, Columbia University Press (New York, 1962), p. 60.

²²Stat. roc., 1958, p. 29.

²³The inputs from other sectors, including depreciation, increased by 179 per cent between 1934-38 average and 1961, valued in 1948 constant prices paid by farmers (see Table 14).

²⁴In 1958 the output was 4 per cent above the prewar level valued in 1948 constant prices (see Table 16, item 5).

²⁵Ibid., p. 55.

²⁶Ibid., 1962, p. 84.

²⁷The employment in non-agricultural sectors increased by 1.5 million between 1948 and 1961 (see ibid., p. 113).

²⁸Ibid., p. 366.

products from domestic production resulted in greater dependence on food imports. The net import of food increased by 59 per cent between 1948 and 1960,²⁹ and the share of agricultural products in total import increased from 16 per cent in 1937³⁰ to 22 per cent in 1960.³¹ The data above clearly indicate that the relative importance of agriculture in the Czechoslovak economy has declined.

The amount of agricultural land in use has diminished since the war. In 1961 it was 6 per cent lower than before the war (Table 1, items 1-2). This decline was caused mainly by a decrease in the labor force in agriculture. Much greater shifts, however, occurred in the use of agricultural land for individual crops. The area sown in grain and pulses (i.e., leguminous plants), for example, decreased by 24 per cent, but that of oil and industrial crops increased by 79 per cent between 1934-38 and 1957-61 (Table 1, items 3-4). Similarly, large shifts occurred in the numbers of livestock. The number of cows decreased by 13 per cent, horses by 32 per cent, but the number of pigs increased by 77 per cent between 1934-38 and 1957-61 (Table 1, items 5-7).

After World War II, agriculture entered a phase of rapid mechanization. The number of tractors increased fourteen times and the value of all machinery and equipment in constant 1956 prices increased by 54 per cent between 1934-38 and 1957-61 (Table 1, items 8-10). To a certain extent, mechanical power replaced horse power. The extensive mechanization required increased amounts of investment; according to official sources, gross investment in 1957 prices increased almost ten times between 1949 and 1961 (Table 1, item 18).³² Significant changes also occurred in the agricultural labor force. The labor force employed in agriculture decreased by 43 per cent between prewar years and 1961³³ and the share of the agricultural labor force in the total labor force declined from 40 to 22 per cent from 1948 to 1961 (Table 1, items 11-13).

²⁹Ministry of Foreign Trade, Zahranicni Obchod, (Prague, 1958), No. 4, p. 6, hereafter referred to as "Zah. obchod."; and Stat. roc. 1962, p. 374-75.

³⁰State Statistical Office, Statistické Zpravy, 1956, No. 1, p. 14. Hereafter referred to as "Stat. zpravy."

³¹Stat. roc., 1961, p. 375.

³²The figure excludes the gross investment in machinery and equipment by private farmers (see ibid., p. 115).

³³The prewar figures refer to 1930. The official data, according to an agricultural census of May 27, 1930, give higher employment in agriculture (see State Statistical Office, Stat. obzor, 1958, No. 4, p. 158) including those who lived on farms but were not gainfully engaged. Part of them constituted a so-called "surplus" of labor (see loc. cit.)

Rapid mechanization and the introduction of labor-saving methods made it possible to withdraw from agriculture two-fifth of the labor force between 1948 and 1961. As a result of this decline, the average number of hectares of agricultural land per worker increased from 3.2 to 5.3 between 1934-38 and 1961 (Table 1, item 14).

In 1949 the rapid reorganization of the social and economic structure of agriculture was begun; state intervention was used to replace the private ownership of land. The area of agricultural land owned by state and local governments increased from 1.7 to 22.1 per cent of the total between prewar years and 1961 (Table 1, item 15), mainly as a result of the acquisition of land abandoned by Sudeten-Germans. But the most spectacular development was the rise of collective farms (of the Soviet type) launched at the latter part of 1949 by the state. By the end of 1952 almost one-third of all agricultural land was collectivized (Table 1, item 16). From 1953 to 1955 the area in collective farms decreased by almost one-fifth under the "new course."³⁴ But at the beginning of 1956 the drive for collectivization was resumed, and at the end of 1958, 76.8 per cent of total agricultural land was in collectives and state farms including the private plots of collective farmers; private farms then accounted only for 23.2 per cent of agricultural land.³⁵ At the end of 1961 private farms accounted for 11.2 per cent of agricultural land.

These changes in ownership were accompanied by great changes in the size of production units. The distribution of production units (farms) according to size and share of agricultural land in each size group is given in Table 2.

From the data given, it appears that the share of small and medium-size farms (2-20 hectares) in total agricultural land decreased from 63.7 per cent in 1949 to 9.1 per cent in 1960. The 20-100 hectares group decreased even more; their land was transferred to collectives and state farms. The area of very small holdings (under 2 hectares) did not change significantly, but their number almost doubled to comprise 89.2 per cent of all farms. Most of the increase in this category is due to small plots of collective farmers which are considered their property. The spectacular increase occurred in the group of farms over 100 hectares in size. This group accounted for 11.7 per cent of agricultural land in 1949, but had risen to 79.8 per cent in 1960. As of April 30, 1958, the average size of the state farms was 5,868 hectares--a veritable latifundia--and that of collectives 290 hectares.³⁶ These changes affected fundamentally the organization of production and, less dramatically, the performance of production units.

³⁴Period during which, among other things, the state authority relaxed the economic discrimination against private farmers (see Vratislav Busek and Nicolas Spulber, eds., Czechoslovakia (New York, 1957), p. 260).

³⁵Czechoslovak Academy of Agricultural Sciences, Sbornik Csazv: Zemedelska Ekonomika, 1959, No. 2 (Supplement), p. 1, hereafter referred to as "Zem. ekon." The 76.8 per cent includes state farms.

³⁶Zem. ekon., 1959, No. 1 (Supplement), pp. II and IV.

The basic structural changes occurred in the organization of production. The enterprise system of Czechoslovak farming was replaced rapidly by centralized state planning. By 1950 the state authority not only was fixing rigidly the prices of all products sold by farmers but was prescribing also to each farmer, through local agents, how much to produce, how much to sell, and how much to purchase. Thus, the function of the farmer as a free manager and entrepreneur completely disappeared. Using heavy price discrimination against private farmers, the state indirectly was forcing farmers to renounce the private ownership of land and other means of production by joining the collectives.³⁷ By April 30, 1962, over 700,000 formerly private farms had been integrated into 8,165 collective farms,³⁸ organized according to uniform statutes decreed by the state. Production methods were altered by the rapid introduction of mechanization through state-owned machine-tractor stations which performed most of the field work of collectives and state farms.

In view of this development a few words need be said about the sociological background of the farmer. The Czechoslovak farmer has a deep rooted sense of private ownership of land, individual freedom, religious feeling, national culture, moral values, tradition, and family farming. Land is to him not only a means of business, but it is also a family heritage to which he is deeply attached. This is the result of historical, political, and social development of a long struggle of the Czechoslovak peasants for abolition of serfdom and liberation from servitude of the feudal era. The serfdom was abolished and hereditary rights to land were granted to the peasants during the rule of the emperor Joseph II, student of Enlightenment and the Physiocrats, from 1780 to 1790. Thus the individual, private family-farming in Czechoslovakia had a much longer tradition than in other East European countries, and especially in Russia, where private family-farming started to gain ground only shortly before the World War I.

When the Czechoslovak government decided to introduce the socialist system of farming, it appealed to the cooperative tradition which was deeply entrenched among the farmers (see above). The collectives were presented as an advanced stage of the traditional, free cooperative movement. Indeed, the official name for a collective is "Unified Agricultural Cooperative." Thus the government was aware of the vigorous opposition of farmers to collectivization and therefore proceeded with the socialization of agriculture with great caution and step by step.

To induce the individual farmers into the collectives, various transitional stages of organization were introduced, which took into consideration the attachment of farmers to their land and capital, and to their freedom concerning decision-making in farming. Four types of collectives were introduced, each representing a different degree of integration. Types I and II, the lower types, which recognize the private ownership of land and private entrepreneurship, are rather preparatory stages for the collectives of

³⁷ By adhering to a collective, type III-IV, the private ownership becomes the collective ownership of the members; for more detail see Busek and Spulber, op. cit., pp. 253-55.

³⁸ Stat. roc., 1962, p. 231.

types III and IV, higher types. These are functionally similar to the Soviet kolkhoz, i.e., the land and other capital of private farmers become the common property of the collective and private ownership is limited to a small plot of land. The main characteristics of the four types of collectives are summarized below.³⁹

Type I: Private ownership of land and other capital is preserved. Machines, however, may become common property. For certain operations, performed collectively, i.e., tillage of land, income is distributed according to the services contributed by each member.

Type II: Land ownership is recognized, but the boundaries of individual plots are abolished and all field operations are performed in common. All livestock is privately owned. Income is distributed according to the work and services of land and other capital contributed, i.e., farmers are receiving rent according to their contribution of land and capital.

Type III: Private land, machinery, farm buildings, and livestock become the common property with the exception of small private plots of collective farmers, which are usually about one-half of one hectare. In addition each member of a collective may retain one cow, three goats, two pigs, five sheep, and an unlimited number of poultry and rabbits. No compensation is paid for land, but 80 per cent of the value of livestock, machinery, and buildings is repaid to farmers, according to the ability of the collective. The collective is managed by a board of managers elected theoretically by the general assembly. The income of the collective is distributed according to the number of "standard working units" performed by its members. The rent according to the acreage contributed is still recognized, but limited to a maximum of 15 per cent of the net income of collectives. If a member withdraws or is expelled from a collective, he is to receive land equal in size to his original contribution, but the location of the land may be different. The value of the other capital contributed may be returned up to 80 per cent of its value after a deduction of compensation payments already made to a withdrawing member.

Type IV (the kolkhoz type): This type is similar in every respect to type III, except that no rent is paid and all income of the collective is distributed according to work units performed by each member.

Lack of reliable data makes it impossible to analyse the performance of different types of collectives, since types I and II were only transitional forms leading to types III and IV. The most common is type III. The performance of collectives as a whole in production is briefly discussed in Chapter VIII and the production data are in Table 23.

Because the socialist organization of farming introduced basic changes in the private farmers' way of life resulting in the disappearance of the private-family farm, most of the farmers reacted with vigorous opposition - known as passive resistance - to the collective system of farming, which no doubt affected unfavorably the performance of Socialist agriculture.

³⁹From Karol Svoboda, *Preco a ako hospodarit podľa vzorovych stanov JRD*, Bratislava, 1957, pp. 417-32; and V. Busek and Spulber, *op. cit.*, pp. 253-55.

In the independent analysis presented in subsequent chapters, the general problem of the comparative effectiveness of agricultural systems, where basic decisions are made by private farmers or central state planners, will be approached by breaking the problem down into manageable and meaningful parts. An attempt will be made to measure the overall performance of the Czechoslovak agricultural sector in the prewar base period and in postwar years, to determine changes in production and productivity, and, finally, to explain, where possible, the reasons for changes in production and productivity during more than the two decade periods of 1934-38 and 1946-61.

CHAPTER II

TOTAL CROP AND ANIMAL PRODUCTION

This chapter explains the concepts and methods used to build the statistical series contained in the accompanying tables on volume of total agricultural production.

A. Concept and Purpose

1. Definition of the Concept

"Total crop and animal production" as measured in this study comprises the production of all crops and pasture (excluding flowers for which no data were available) and all animal products including livestock inventory changes, before any allowance is made for utilization for agricultural production (e.g., fodder). The production is measured at farm level (in terms of "barn yield")¹ for each calendar year. This concept is the same as "gross agricultural production" (hruba zemedelska vyroba) used in Czechoslovakia,² Soviet Union,³ and other east European countries; in Luxembourg, Switzerland, and most Latin American and Asian countries⁴ various terminology is used.

"Total crop production" is measured in many countries including the United States.⁵ The term "total crop and animal production" is used here because it describes clearly the coverage of production, and because the term "total crop production" (with the same concept for crop production as ours) is

¹The measurement of production in terms of "biological" yield, estimated on the field before harvesting, was used in the Soviet Union but not in Czechoslovakia.

²Stat. roc. 1958, p. 187.

³Naum Jasny, The Socialized Agriculture of the USSR (Stanford, 1949), p. 775.

⁴Food and Agriculture Organization of the United Nations, Meeting on Index Numbers of Food and Agricultural Production, National Indices of Agricultural Production (Rome, 1956), pp. 2-7.

⁵United States Department of Agriculture, Agricultural Statistics 1952 (Washington, 1952), p. 661.

already being used by many O.E.E.C. countries.⁶ The term "gross agricultural production" used by Czechoslovakia (and other east European countries) is not suitable because its meaning in the United States is different.⁷ Also, the Food and Agriculture Organization of the United Nations defines the term "gross agricultural production" as total crop and animal production less allowances for feed, seed, waste, and semi-processed items (skim milk, bran, oilcakes and other concentrated feeds) from domestic production used as animal food-stuffs.⁸ Thus to avoid confusion the term "gross agricultural production" is not used in this study.

"Total crop and animal production," it should be noted, contains the element of duplication; it includes fodder-crops, feed, seeds, eggs used for hatching, and milk fed to calves, all of which are re-employed in the agricultural sector and thus are counted twice.

2. Purpose

However imperfect, the concept of total crop and animal production serves a useful purpose in several respects. It represents a starting point (first measure) from which other economically more useful measures (end-use output, gross, and net product to be defined later) of agriculture's performance can be calculated. It can be used to check the official Czechoslovak data on total crop and animal production available only in relative figures. Finally, the less inclusive concept of total crop production, taken separately, is one comprehensive measure of the land's productiveness.

B. Methods of Estimating the Quantity of Total Crop and Animal Production

This section describes the methods used in Czechoslovakia to estimate crop and animal production. These methods will be compared with those used in

⁶The Organization for European Economic Cooperation, OEEC Statistical Bulletins: Definitions and Methods, Part IV (Paris, 1955), p. 13.

⁷In the United States the "gross farm production measures the production of all crops and pasture consumed by all livestock, and the product added in the conversion of feed and pasture into livestock and livestock products for human use and into farm-produced horse and mule power," (Agricultural Statistics 1952, op. cit., p. 661).

⁸Food and Agriculture Organization of the United Nations, Meeting on Index Numbers of Food and Agricultural Production, National Indices of Agricultural Production (Rome, 1956), pp. 2-7.

other countries. Then, the reliability of official figures will be appraised. Finally, the results of estimation will be summarized.

1. Czechoslovak Methods for Estimation of Crop and Animal Production

The State Inspectorate for Crop Production in Czechoslovakia estimates the yields per hectare of major crops by stratified random sampling methods. The first measure is obtained immediately before the harvest. This is the so-called "biological yield." The losses incurred during harvesting, hauling, and threshing are estimated by the same service and deducted from the "biological yields." The preliminary estimates of yield so obtained are checked later against the actual "barn yield"⁹ from plots corresponding to the plots surveyed in the pre-harvest sampling. Corrections of the pre-harvest estimates are made if the results of the actual "barn yield" sampling differ significantly. The corrected "barn yield" per hectare of any given crop is then multiplied by the number of hectares harvested in a given region. The results of all the regions are summed up to arrive at the total production of any given crop available at the farm level for utilization in further production on the farm (for example, feed or seed), for human consumption, or for industrial use.¹⁰

Official Czechoslovak figures for the production of meat (from cattle, calves and pigs) in terms of live weight include all sales plus the consumption on farms. Figures for the production of milk include the total quantity obtained by milking plus milk consumed by suckling calves. For the socialized sector the total quantity of milk is directly measured; for the private sector these statistics are obtained at the district level by multiplying the average yield of milk per cow (including cows temporarily not producing milk) by the total number of cows in each district; the sum of the quantities in all districts gives the total for the country.^{11,12} The production of eggs is assessed by the same procedure as that for milk.

For production of some crops (vegetables, oil seeds, minor seeds, straw, and pasture) official data are not available after 1949. In this study, the production of these items was estimated on the basis of area sown

⁹For more detailed discussion concerning the differences between the barn yield and biological yield see Naum Jasny, op. cit., pp. 725ff.

¹⁰The detailed method of official Czechoslovak estimation of crop production is described in Metody zjistovani zemedelskych plodin, State Statistical Office (Prague, 1956), pp. 4-32.

¹¹Stat. roc. 1957, p. 110.

¹²Stat. roc. 1958, p. 188.

for each item and the average yield per hectare derived from the yield of crop whose behavior is known to be, in general, in strong positive correlation with the yield of the crop in question.

Also some statistical series of animal production for which official production data are missing¹³ were estimated on the basis of the number of animals for each year and the average yield per animal for the period for which data are available. The changes in inventory of livestock were obtained as the product of net changes in numbers for each series between the beginning and the end of each year and the average live weight per head respectively.¹⁴ No account has been taken of physical changes in stock relating to crop production because of non-availability of the data.¹⁵

2. Comparison of the Czechoslovak Methods of Estimation with those of Other Countries

On the whole, the technique used by the Czechoslovak official authorities in estimating "total crop and animal production" does not differ significantly from the techniques used in west European countries and in the United States. In the United States reporting is more refined. The random sampling method is used. Farmers provide the necessary data to state offices by mail-questionnaires. State statisticians process the data and send them to the

¹³ Sheep, goats, horses, poultry, rabbits, and manure.

¹⁴ To obtain a more precise result, each series (livestock) ought to be subdivided into several age-groups which would permit more exact measurement of changes due to relative shifts in different age-groups. Lacking the detailed data on age distribution from year to year, the measurement of changes for individual age-groups could not be done.

¹⁵ Physical changes in stock relate to changes in stock of finished products awaiting sale (i.e., potatoes and wheat) and changes in stock of work in progress (i.e., fodder crops awaiting consumption on the farm and ripening crops not yet gathered) between the beginning and the end of each year. The changes in stock may be of significant proportions in times of rapid expansion or contraction of production and, therefore, they should be included in each year's production to obtain an exact measure of production for each year. However, the changes in Czechoslovak agricultural production were gradual (except for 1947, when the production greatly decreased because of drought) from year to year, and thus, this omission seems not to affect significantly the total crop production over a longer period.

Most countries' official statistics omit the changes in stock and the changes of work in progress from crop production. (See O.E.E.C. Statistical Bulletins, Definitions and Methods, Part 4, op. cit., pp. 13-49.)

Crop Reporting Board which re-examines, for final decision, the basic data, especially for the "speculative" crops. The Agricultural Estimates Division of the United States Department of Agriculture acts as a coordinating body for the whole country.¹⁶ The coverage of the United States and of some west European countries of agricultural production data is more exhaustive than that of Czechoslovakia and some east European countries.

3. The Reliability of Czechoslovak Data

The official data concerning the quantity produced of different agricultural commodities seem to meet the test of internal consistency. No major deficiency was found by cross-checking the data. It seems that the State Statistical Office in Prague processes the collected data with care and impartiality. However, the basic raw data are collected by local government agents under the direction of the State Inspectorate for Crop Production. The reliability of measures developed in this study depends largely on the impartiality of these primary sample-taking agents. Unfortunately, we have no means to test their impartiality.¹⁷

4. The Results of Estimation

Table 3 gives official production data (and our own estimates for missing items) for thirty-nine individual crops in physical quantities (in thousands of metric tons) for 1934-38 average and for 1946 to 1961. Total animal production in physical quantities consisting of twenty-seven individual series is given in Table 4. The sources for individual series and years, as well as explanations of our techniques of estimation accompanied by supporting tables, are given for total crop production in Appendix A and for total animal production (including changes in stock) in Appendix B.

Broadly, the behavior of production was as follows: the production of almost all crops covered by our series was much lower in the early postwar years than before the war. By 1948, some series approached the prewar level. In the following years, some of them declined while others increased sharply.

By 1961, the production of rye, oats, pulses, potatoes, root-crops for feed, hay, hops, and tobacco still had not reached the prewar level. However, the production of corn, barley, oil crops, sugar beets and fibers had increased sharply and had by-passed the prewar level. Among the animal products, meat, wool, and eggs production had increased, but the production of milk remained below the prewar level.

¹⁶For detailed description of estimation, see U.S. Department of Agriculture, Major Statistical Series of the U.S. Dept. of Agriculture; Crop and Livestock Estimates, Vol. 8, Washington, 1957.

¹⁷The question of impartiality and competency in taking the primary samples applies to any other country as well.

The behavior of total crop and animal production over the period of years can be followed only if the individual series (expressed in different units) are combined into one figure by weighting. The weights used in measuring the total crop and animal production are discussed in the next section.

C. Weighting System and Base Period

1. Weights and Base Used by International Organizations and Other Countries

The Food and Agriculture Organization of the United Nations uses uniform "wheat relative prices" (i.e., prices of all commodities are expressed as percentages of the corresponding wheat price) as weights for all countries and regions of the world.¹⁸ The commodity weights for products entering international trade in considerable amounts are world prices (average prices in leading exporting countries adjusted to averages of national prices in leading producing countries). For commodities not internationally traded in large quantities, the FAO uses the prices in leading producing countries. All prices are in French gold francs per metric ton in the 1934-38 period. The price of wheat in the 1934-38 period, the base period for weight calculations, happened to be 100 gold francs per ton. Each commodity's price in gold francs per metric ton gives its price relation to wheat. This weighting system based on "wheat relative prices" for the whole world is subject to criticism because the price relationship of wheat to the other commodities differs greatly among the regions. The prices of many products also differ from one continent to another because of different cost and demand conditions.¹⁹ Finally, the official currency exchange rates used to convert national prices into uniform prices (gold francs) do not represent the actual purchasing power parities of the different currencies. This introduces an element of arbitrariness into the uniform weights.²⁰

¹⁸FAO, Meeting on Index Numbers of Food and Agricultural Production: Introduction (Rome, 1956), p. 2.

¹⁹To correct the deficiencies of uniform world weights the FAO intends to shift to regional weights based on weighted average prices received by producers (prices at farm gate); for detailed proposals see FAO, Meeting on Index Numbers of Food and Agricultural Production: The Weighting System (Rome, 1956), pp. 1-25.

²⁰P. V. Sukhatme and P. L. Sherman suggest a new system based on each country's weights by assuming that the value in any country of a unit of its agricultural product is the same for each country. This procedure would avoid direct use of actual exchange rates by using the exchange parities for agricultural production. For detailed discussion, see "International Indices of Agricultural Production," Monthly Bulletin of Agricultural Economics and Statistics, FAO, 1956, No. 3, pp. 104 (Hereafter referred to as "FAO-Mon. Bull.")

Table 3

TOTAL CROP PRODUCTION, 1934-38 AND 1946-1961*

(thousand metric tons)

Item	1934-38 average	1946	1947	1948	1949	1950	1951
1. Wheat	1,513	1,320	854	1,429	1,556	1,430	1,476
2. Rye	1,577	1,136	988	1,143	1,316	1,147	1,015
3. Barley	1,109	766	669	898	1,023	1,030	1,143
4. Oats	1,212	825	714	994	1,062	895	929
5. Corn	225	204	133	297	240	218	302
6. Edible pulses	38	27	17	33	33	24	33
7. Colza and rape	7	15	9	4	18	20	42
8. Poppy	12	12	9	13	11	7	6
9. Flax, raw stalks	45	51	30	54	58	35	93
10. Sugar beets	4,664	4,341	2,407	4,295	4,283	6,296	5,203
11. Potatoes	9,635	9,159	4,678	6,067	5,772	8,156	7,356
12. Root-crops	4,653	4,323	2,040	3,820	3,551	3,462	3,434
13. Forage crops	3,863	2,412	1,563	3,363	4,786	3,247	4,434
14. Hay from meadows	4,017	2,484	1,799	2,937	3,678	2,640	3,933
15. Hops	9.17	5.29	4.68	4.99	4.40	5.32	5.12
16. Tobacco	11.16	8.58	7.32	9.01	5.64	6.16	7.54
17. Grapes	66.12 ^a	110.01	81.80	66.32	55.27	70.54	73.74
18. Fruits	465 ^a	559	538	637	609	633	438
19. Vegetables, com. gardening	586	693	291	746	538	577	572
20. Vegetables, househ. gardening	162	191	80	206	149	159	158
21. Hemp, raw stalks	28	28	13	24	16	9	16
22. Feed pulses, incl. millet, buckwheat	113	82	60	98	101	81	99
23. Flaxseed	6.35	8.05	5.84	10.14	8.26	4.88	13.08
24. Hempseed	2.93	3.45	2.32	3.43	1.63	0.90	1.68
25. Soybean	0.83	0.77	0.87	1.97	1.91	1.86	2.54
26. Sunflower	0.55	2.40	2.04	5.25	5.26	5.26	7.34
27. Mustard	0.37	6.40	5.27	16.05	14.62	11.15	11.04
28. Chicory	67.89	56.86	26.29	50.05	57.55	52.78	68.48
29. Peppers, kumin, aromatic medical crops	7.73	9.55	5.47	8.98	10.15	11.19	16.87
30. Pasture	3,195	1,779	1,338	2,475	2,973	2,328	3,415
31. Sugar beet, seed	4.84	2.82	1.28	2.83	4.59	7.35	10.86
32. Root crops, seed	2.16	2.01	0.95	1.77	1.65	1.61	1.59
33. Forage crops, seed	19.67	12.28	7.95	17.13	24.37	16.54	22.58
34. Grass, seed	3.25	2.01	1.46	2.38	2.98	2.14	3.19
35. Straw for litter	5,357	4,322	3,205	4,525	5,054	4,495	4,527
36. Straw for feed	3,325	2,344	1,980	2,859	3,036	2,799	3,100
37. Pulses straw	217	157	111	190	194	153	193
38. Sugar beet leaves	2,332	2,171	1,204	2,148	2,142	3,148	2,602
39. Other root crop leaves	1,821	1,753	812	1,606	1,431	1,416	1,409

*For sources and methods of estimation see Appendix A.

^aAverage 1934-37.

	<u>1952</u>	<u>1953</u>	<u>1954</u>	<u>1955</u>	<u>1956</u>	<u>1957</u>	<u>1958</u>	<u>1959</u>	<u>1960</u>	<u>1961</u>
1.	1,573	1,556	1,107	1,473	1,541	1,525	1,346	1,649	1,503	1,666
2.	930	954	803	968	1,050	948	937	967	897	994
3.	1,137	1,247	1,115	1,291	1,408	1,362	1,199	1,467	1,745	1,581
4.	927	869	866	974	1,034	899	871	929	1,020	959
5.	212	430	382	391	385	445	479	503	572	461
6.	24	37	33	34	29	18	18	20	25	25
7.	30	26	21	43	48	39	48	73	55	84
8.	7	9	9	8	8	6	5	8	15	13
9.	73	97	109	141	143	100	129	123	134	134
10.	4,760	5,588	5,603	6,152	4,405	6,775	6,946	4,946	8,368	6,894
11.	7,924	9,702	8,314	7,905	9,635	8,756	6,589	6,334	5,093	5,331
12.	3,212	3,952	3,631	4,210	3,043	3,572	3,204	2,641	3,585	2,618
13.	3,597	4,007	4,207	5,693	5,257	4,759	5,712	5,559	5,806	6,188
14.	2,706	2,982	2,805	3,980	3,969	3,464	3,746	3,595	3,031	3,216
15.	3.70	5.63	5.18	6.13	4.90	4.82	7	6	7	6
16.	9.34	11.84	11.19	12.63	10.32	8.86	8	6	5	5
17.	34.20	34.72	67.88	71.83	34.05	69.95	93	49	56	62
18.	315	721	535	483	571	356	774	397	829	491
19.	620	792	711	729	665	723	679	548	727	615
20.	171	219	196	201	184	200	297	320	352	377
21.	14	20	23	40	35	32	32	32	37	32
22.	91	106	114	137	112	88	92	96	117	120
23.	11.15	14.49	16.06	17.78	22.27	13.96	18	17	20	19
24.	1.39	2.13	2.37	4.14	4.03	2.67	3	3	4	3
25.	1.90	3.76	3.60	3.58	2.11	1.66	1	1	2	1
26.	5.60	11.32	10.93	10.99	6.96	7.62	8	7	9	3
27.	7.21	6.60	5.34	3.91	3.82	2.54	2	2	7	3
28.	48.46	92.29	83.64	79.46	71.21	67.10	68	77	78	55
29.	13.60	28.94	28.99	30.10	24.84	25.13	25	27	27	21
30.	2,323	2,521	2,330	3,065	3,064	2,772	2,996	2,757	2,407	2,586
31.	9.94	12.47	13.60	19.14	12.14	16.34	22	14	11	7
32.	1.49	1.83	1.69	1.95	1.41	1.66	1	1	2	1
33.	18.32	20.41	21.42	28.99	26.77	24.24	29	28	30	32
34.	2.19	2.42	2.27	3.22	3.21	2.80	3	3	2	3
35.	4,467	4,567	3,587	4,608	4,831	4,542	4,302	4,879	4,538	4,977
36.	2,972	3,325	3,086	3,469	3,692	3,534	3,329	3,786	4,358	3,919
37.	167	210	216	250	204	154	159	167	206	209
38.	2,380	2,794	2,802	3,075	2,202	3,388	3,473	2,473	4,184	3,447
39.	1,349	1,683	1,539	1,738	1,320	1,519	1,415	1,194	1,579	1,220

Table 4

TOTAL ANIMAL PRODUCTION, 1934-38 AVERAGE AND 1946-1961*

(Thousand metric tons unless specified)

<u>Item</u>	<u>1934-38 average</u>	<u>1946</u>	<u>1947</u>	<u>1948</u>	<u>1949</u>	<u>1950</u>	<u>1951</u>
A. CHANGES IN STOCK, live weight:							
1. Horses	-2.2	2.2	-12.7	-1.1	0.6	-13.2	-18.2
2. Cows	5.5	-20.9	-87.4	5.0	45.6	64.4	42.4
3. All other cattle	37.7	-43.0	-179.1	125.4	154.6	-8.9	-1.3
4. Sows, 6 mo. & over	-3.8	4.1	-14.5	22.4	8.2	2.4	13.9
5. All other pigs	3.2	29.0	-15.2	28.3	48.3	-22.4	18.3
6. Sheep	1.8	-1.0	-5.4	3.7	3.7	3.3	10.4
7. Goats	0.2	-9.4	-9.3	2.8	1.5	-2.0	-2.8
8. Chickens	0.9	2.9	3.2	6.6	2.8	1.2	1.0
9. All other poultry	0.2	0.5	-0.7	0.6	0.8	-0.4	0.2
10. Bee-hives, in 1000	-25	-102	43	2	99	-5	109
B. MEAT PRODUCTION, live weight:							
11. Cattle	288.8	321.5	435.4	195.8	197.3	293.9	290.6
12. Calves	51.2	44.3	45.6	28.2	22.4	40.4	34.4
13. Pigs	416.2	178.3	244.4	216.4	299.1	462.0	229.7
14. Sheep	4.7	4.1	6.9	2.7	2.4	3.2	3.6
15. Goats	5.0	3.4	4.8	2.1	1.9	2.1	2.1
16. Horses	12.6	18.6	27.0	10.0	9.1	22.2	26.9
17. Poultry	51.3	30.0	36.9	34.1	41.5	45.0	46.1
18. Rabbits	18.7	23.7	23.7	23.7	23.7	23.7	23.7
C. EGGS AND MILK:							
19. Eggs, mill. pieces	1,899	776	903	1,109	1,383	1,607	1,768
20. Cow milk, mill.hl.	46.9	29.1	26.8	25.0	28.6	31.7	34.5
21. Sheep milk, " "	0.3	0.2	0.2	0.2	0.2	0.3	0.4
22. Goat milk, " "	5.2	4.5	3.6	3.3	3.9	4.1	4.0
D. OTHER ANIMAL PRODUCTS:							
23. Wool, greasy basis	0.9	1.0	0.8	0.8	0.8	1.1	1.3
24. Feather	1.3	1.3	1.3	1.3	1.3	1.4	1.4
25. Honey	3.6	0.8	1.8	1.1	1.5	3.0	2.7
26. Wax	0.2	0.1	0.1	0.1	0.1	0.1	0.1
27. Manure, mill. met. tons	26.2	24.6	22.4	21.7	24.2	25.9	26.5

*Sources and methods of estimation are in Appendix B.

	<u>1952</u>	<u>1953</u>	<u>1954</u>	<u>1955</u>	<u>1956</u>	<u>1957</u>	<u>1958</u>	<u>1959</u>	<u>1960</u>	<u>1961</u>
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1.	-7.2	-8.3	-0.6	-	0.6	-13.8	-33.6	-36.9	-32.5	-20.9
2.	39.0	-36.8	-30.8	-6.6	-7.2	-2.8	7.7	4.4	-13.8	8.2
3.	-0.7	-98.0	5.0	25.8	13.2	-12.6	25.8	42.4	36.1	38.4
4.	-4.4	-7.2	8.2	-3.1	-1.5	-4.6	10.2	11.4	1.0	-0.3
5.	36.9	-36.5	28.5	27.7	4.8	4.8	-10.9	17.4	13.9	-3.4
6.	9.3	1.8	-	-0.9	-2.2	-3.4	-3.7	-4.6	-4.1	-2.2
7.	0.1	-1.0	0.2	-2.5	-2.7	-2.4	-2.1	-1.6	-2.2	-0.9
8.	4.3	0.9	3.2	2.3	1.6	1.2	0.4	1.0	0.2	0.2
9.	1.0	-0.3	0.4	-0.5	-0.5	-0.4	0.4	-0.2	-0.6	0.4
10.	-20	47	-135	32	87	23	69	-14	.5	..

11.	302.3	295.6	267.4	271.6	293.1	312.1	313.7	322.5	346.7	359.8
12.	42.0	48.0	42.5	41.5	42.1	44.7	35.5	29.8	30.4	23.8
13.	397.2	355.6	381.3	454.7	523.0	543.1	542.4	550.4	552.4	578.1
14.	4.8	5.9	6.1	7.0	8.2	9.2	8.6	9.0	8.0	5.8
15.	1.9	1.9	1.9	1.9	1.8	1.7	1.6	1.5	1.4	1.3
16.	15.4	16.3	8.3	7.8	7.8	21.5	40.2	42.5	37.3	25.1
17.	47.3	52.6	53.6	57.0	59.1	60.4	64.2	69.8	71.6	72.9
18.	23.7	17.1	10.5	3.9	4.1	4.3	4.3	4.3	4.5	4.6

19.	1,717	2,041	1,751	1,734	1,900	2,055	2,070	2,135	2,267	2,351
20.	34.8	31.5	31.7	34.2	36.0	36.3	36.5	36.6	37.1	38.3
21.	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.4	0.4	0.4
22.	3.8	3.3	3.4	3.6	3.6	3.4	3.3	3.1	3.0	2.9

23.	1.7	1.9	2.0	1.9	1.9	1.8	1.6	2.9	2.6	2.3
24.	1.4	1.6	1.5	1.6	1.5	1.4	1.4	1.6	1.6	1.6
25.	1.7	2.2	2.6	2.1	2.5	3.4	4.1	6.3	3.4	2.3
26.	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.1
27.	26.9	26.3	25.2	25.5	25.8	25.6	25.7	26.1	26.2	26.5

The O.E.E.C. calculates the agricultural production of its member countries by using weights based on the average producer prices in the 1934-38 period for all O.E.E.C. countries combined.²¹ The prices of all commodities are expressed as percentages of the weighted average wheat price for all O.E.E.C. countries.²² The base for calculation is the average of 1934-38. In the United States the average 1947-49 prices received by farmers in each of the nine main regions are used as basic weights to calculate production in the whole country since 1940. The base period used is the average of 1947-49.²³

European countries, except the Federal Republic of Germany, are using prices received by farmers as weights in calculating their agricultural production. The Federal Republic of Germany uses as weights the "grain equivalent relative values" based on calories of digestible protein, carbohydrate, and fat in grain.²⁴

2. Base and Weights Used in this Study

The base period chosen in this study for the calculation of the total crop and animal production in crowns and for index numbers of total crop and animal production is the prewar five-year average, 1934-38. The use of a five-year average seems to be adequate to smooth out seasonal fluctuations due to weather conditions.²⁵ The Czechoslovak official indexes are based on one year (1936) only. Their disadvantages will be discussed in the next section.

²¹OEEC, Definitions and Methods, Part 4, op. cit., p. 10.

²²Difference between the FAO and OEEC procedure is that in the former the weighted average world prices of individual commodities are expressed as percentages of the weighted average world price of wheat, in the latter the weighted average prices paid to producers of individual commodities for all OEEC countries combined are expressed as percentages of the weighted average price of wheat paid to producers for all OEEC countries combined. All prices are in French gold francs. The national prices were converted into gold francs by using the official exchange rates during 1934-38.

²³U.S. Dept. of Agriculture, Major Statistical Series of the U.S. Dept. of Agriculture: Agricultural Production and Efficiency, Vol. 2, Washington, D.C., 1957, pp. 23-27.

²⁴FAO, National Indices of Agricultural Production, op. cit., pp. 12-63.

²⁵Stat. roc., 1958, p. 190.

The 1934-38 period was chosen as the base for three reasons. First, it is relatively free of any "abnormality" (i.e., war, depression, natural disasters). Second, most comparisons of agricultural production over time in Czechoslovakia and other countries use the prewar period as the base.²⁶ Third, there is no postwar period which could qualify as "normal;" until 1949 production did not recover from wartime devastation and thereafter collectivization and new governmental policies prevented attainment of the prewar level of production.

The weights used in the calculation of the volume of total crop and animal production as well as of index numbers are the weighted average prices received by farmers for the sale of agricultural products.²⁷ Three alternative price weights were selected: 1936, 1948, and 1956 weighted average prices received by farmers. Thus, total crop and animal production is calculated alternatively using 1936, 1948, and 1956 prices. Since the choice of weights is basic in calculating index numbers, the use of three different price weights makes it possible to see their effect on measures of change in the total production over the same period of time.

Since agricultural prices in prewar years were more stable than in postwar years, the 1936 prices reflect a price structure little disturbed by government intervention.²⁸

The second set of weights, the 1948 prices, reflect a transitional period between a private enterprise and a rigidly planned centralized system. Although all agricultural prices were regulated by the state, they were set essentially according to prevailing demand and supply conditions.²⁹

The measurement of production by using the third set of weights, the 1956 prices received by farmers, is of great interest. First, these price weights are for the most recent period; second, the prices reflect the preferences of State planners rather than those of consumers.

The purpose of alternative use of 1936, 1948, and 1956 prices received by farmers as weights can be summarized as follows: (1) it shows the effect

²⁶FAO, Meeting on Index Numbers of Food and Agricultural Production: Changing the Base Period of the Index Series, Rome, 1956, pp. 1-2.

²⁷Stat. roc. 1958, pp. 320 and 330; and Statistický Zpravodaj, Prague, State Statistical Office, 1950, No. 2, pp. 52-54 (later referred to as "Stat. zpravodaj").

²⁸Except the regulation of prices for main crops by the grain monopoly (see Weirich, op. cit., p. 120; and Chapter I).

²⁹The prices of animal products were set relatively higher than those of crops in 1948 in relation to 1936. The prices of main crops were high monopoly prices in 1936 (Stat. zpravodaj, 1950, No. 2, pp. 53-56).

of different price weighting systems on the measure of changes in total production; (2) for the years 1934-38, 1948, and 1956, the aggregates, obtained by using 1936, 1948, and 1956 weights respectively, represent the actual money values in current prices of total crop and animal production; (3) the aggregates, obtained by weighting the quantities of individual crops and animal products for any year (period) by the 1936 or 1948 or 1956 prices received by farmers, if expressed in relatives, give the price index of all agricultural products. This price index is a rough measure of the index of prices received by farmers between 1936, 1948, and 1956, with 1936 as the base.

The prices received by farmers in 1936, 1948, and 1956 which are used as weights to calculate total crop and animal production are given in Tables 5 and 6 for all crops and for animal products, respectively. For 1936 and for 1948 prices received by farmers were available for most products. For 1956, however, only the prices received by farmers for more basic products are accessible.³⁰

The prices of products for which no data are available were estimated in several ways. For some items the prices were derived from prices of other similar items on the basis of their price relationships in the year for which such prices are available. For some items (for example, root-crops for feed, pulses, straw, sheep milk, and goat milk) the prices were derived from other similar items on the basis of their nutritive value in terms of protein. For 1956, the estimates of prices received by farmers were calculated on the basis of delivery and of above-delivery prices and the respective share of total sales marketed at each price.

Prices received by farmers contain a subsidy for 1936 and for 1948, but the subsidy was not large (1,199 million crowns to state farms in 1948.)³¹ The prices received by farmers were calculated from total proceeds for each commodity and the quantity sold. Thus the total proceeds include all additional payments (bonuses) in excess of the basic price.³² The existence of several prices fixed arbitrarily by the government for each commodity makes it impossible to calculate the exact amount of subsidy included in the 1956 prices received by farmers.³³

³⁰ Prices of wheat, rye, barley, potatoes, sugar beets, colza, hops, flax, cattle, pigs, milk, and eggs (see Stat. roc. 1958, p. 330).

³¹ Statni zaverecny ucet republiky Ceskoslovenske, Prague, Supreme Controller's Office, 1948, p. 25.

³² Stat. zpravodaj., 1950, No. 2, pp. 53-54.

³³ Certain regions benefitting from favorable climatic conditions received subsidy because above-average production yielded a large share of sales at higher prices than those set for compulsory delivery of certain products. However, other regions affected adversely by weather received much lower prices because the share of sales higher than above-delivery prices was small or nil. Also the discriminatory fixing of the amount of compulsory deliveries

Table 5

PRICES OF CROPS PAID TO PRODUCERS IN 1936, 1948 AND 1956*

(Crowns per metric ton)

(1)	(2)	(3)	(4)
<u>I t e m</u>	<u>1936</u>	<u>1948</u>	<u>1956</u>
1. Wheat	1,689.0	4,020.3	1,155.0
2. Rye, incl. mixed rye and wheat	1,443.0	3,743.6	976.0
3. Barley	1,422.0	3,646.2	1,306.0
4. Oats, incl. mixed oats & barley	1,115.0	2,794.8	807.0
5. Corn	1,150.0	3,165.4	914.0
6. Edible pulses	3,288.0	6,170.0	3,200.0
7. Colza and rape	1,197.0	8,838.7	2,160.0
8. Poppy	6,799.0	17,638.2	9,821.2
9. Flax, raw stalks	962.8	3,702.3	1,614.0
10. Sugar beets	124.0	641.8	149.8
11. Potatoes	440.4	1,283.6	333.0
12. Root-crops for feed	111.6	577.6	134.8
13. Forage crops on arable land	401.3	1,342.0	383.9
14. Hay from meadows	364.8	1,220.0	349.0
15. Hops	27,500.0	93,916.4	23,890.0
16. Tobacco	4,429.0	34,630.0	9,600.0
17. Grapes	2,546.9	9,457.4	4,650.0
18. Fruits	2,546.9	9,457.4	2,620.0
19. Vegetables, commercial gardening	1,038.5	3,818.8	1,070.0
20. Vegetables, household gardening	1,038.5	3,818.8	1,070.0
21. Hemp, raw stalks	697.1	2,680.5	1,168.5
22. Feed pulses, incl. millet, buckwheat, mixture	1,280.6	3,209.8	1,031.9
23. Flaxseed	1,328.0	9,805.7	2,778.0
24. Hempseed	905.5	6,686.5	4,000.0
25. Soybean	1,267.4	9,358.4	1,954.0
26. Sunflower	723.8	5,344.8	1,316.0
27. Mustard	3,195.0	2,064.3	2,100.0
28. Chicory	250.0	1,200.0	286.0
29. Pepper, kumin, aromatic, medical, and other industrial crops	5,857.6	14,784.6	10,600.0
30. Pasture	364.8	1,220.0	349.0
31. Sugar beet seed	3,211.1	16,620.7	3,879.0
32. Root crops, seed	3,211.1	16,620.7	3,879.0
33. Forage crops, seed	6,410.0	33,470.0	7,798.5
34. Grass, seed	6,410.0	33,470.0	7,798.5
35. Straw for litter	154.7	493.3	130.0
36. Straw for feed	175.6	560.0	160.0
37. Pulses straw for feed	219.5	700.0	200.0
38. Sugar beet leaves for feed	49.6	256.7	60.0
39. Other root crop leaves for feed	41.3	213.7	50.0

*Sources and methods of estimation are in Appendix C,

Sources and Notes to Table 5.

Table 6

PRICES FOR ANIMALS AND ANIMAL PRODUCTS IN 1936, 1948 AND 1956*

(Crowns per metric ton unless specified)

(1)	(2)	(3)	(4)
<u>I t e m</u>	<u>1936</u>	<u>1948</u>	<u>1956</u>
A. CHANGES IN STOCK, live weight:			
1. Horses	3,190.0	12,390.4	3,640.0
2. Cows	4,492.5	22,105.6	6,500.0
3. All other cattle	5,322.5	21,030.9	6,500.0
4. Sows, 6 months and over	6,660.0	36,733.3	9,070.0
5. All other pigs	6,660.0	36,733.3	9,070.0
6. Sheep	4,456.7	20,849.9	6,129.5
7. Goats	3,061.8	14,323.9	4,212.0
8. Chickens	8,592.9	46,499.8	12,647.5
9. All other poultry	8,592.9	46,499.8	12,647.5
10. Bee-hives, per hive	90.0	475.0	175.0
B. MEAT PRODUCTION:			
11. Cattle	4,907.5	21,568.2	6,500.0
12. Calves	5,777.5	24,854.7	6,500.0
13. Pigs	6,660.0	36,733.3	9,070.0
14. Sheep	4,456.7	20,849.9	6,129.5
15. Goats	3,061.8	14,323.9	4,212.0
16. Horses	3,190.0	12,390.4	3,640.0
17. Poultry	8,592.9	46,499.8	12,647.5
18. Rabbits	3,952.7	21,390.0	5,829.5
C. EGGS AND MILK:			
19. Eggs, per 1000 pieces	500.0	2,560.0	630.0
20. Cow milk, per hectoliter	102.5	488.2	142.0
21. Sheep milk, per hectoliter	136.7	650.9	189.3
22. Goat milk, per hectoliter	102.5	488.2	142.0
D. OTHER ANIMAL PRODUCTS:			
23. Wool, greasy basis	15,937.5	87,500.0	30,000.0
24. Feather, unstripped	25,745.0	105,200.0	28,614.4
25. Honey	11,569.8	61,140.0	22,500.0
26. Wax	16,673.3	135,865.0	50,000.0
27. Manure	55.0	165.0	55.0
E. PRODUCTS RETURNED TO FARMS:			
28. Milling offals	925.8	1,681.9	625.0
29. Oilcake	1,421.1	2,712.8	1,177.5

*Sources and methods of estimation are in Appendix C,
sources and notes to Table 6.

On the whole, the prices received by farmers, as calculated by the State Statistical Office in Prague, seem to be reliable because no major inconsistency was found by cross-checking the official data. Our own estimates of prices for commodities for which no official data are available must be considered as rough approximations of the unknown prices. However, the bias in individual items may not affect, to any significant degree, total crop and animal production because the estimates were used only for secondary items, amounting to less than five per cent of total production. For tables 5 and 6 the sources of official prices and details of the method of estimating prices for which no data were available are explained in Appendix C.

The formula used for the calculation of the indexes of total crop and animal production, using alternatively the 1936, 1948, and 1956 prices received by farmers as weights, is the modified Laspeyres' Formula and the base period is always the 1934-1938 average.

D. Results and Evaluation

1. Results Obtained by Using Different Weighting Periods

The volume of total crop and animal production calculated by the procedure outlined in Sections B and C is summarized in Table 7. Results are given separately for total crop production and for total animal production and then are combined into the one figure of total crop and animal production. The data are given in absolute magnitudes from which we calculated the respective indexes.

The indexes of volume of total crop production calculated alternatively in the 1936, 1948, and 1956 prices (Table 7, items 4-6) differ from each other in different years but the differences are not large. The largest differences between the three indexes are in 1960. For that year, using the 1948 price weights, the index is 3.6 per cent higher than the index resulting from using the 1936 price weights; the index resulting from using the 1956 price weights is 1.8 per cent higher than that resulting from using the 1948 price weights. Thus, the index resulting from using the 1956 price weights is over five per cent higher than that resulting from using the 1936 price weights. This difference is due to a very good 1960 harvest of certain crops (for example, sugar beets, colza and rape, oilseeds) whose prices increased relatively faster in the period 1936-48 and in 1956 than the prices of other crops.

at low prices affected the prices received by individual farmers (see Nova Mysl, 1958, No. 7, p. 615). For this study, only the direct subsidy to state farmers, MTS, and collective farms was estimated. They amounted to 2,260 million crowns in 1956 (Project on National Income in East Central Europe, National Income and Product of Czechoslovakia, 1955-56, Ms., p. 190). The subsidies received via differential pricing of farm products, if any, are not included.

Table 7

TOTAL CROP AND ANIMAL PRODUCTION, 1934-38 AVERAGE AND 1946-61;

Item	1934-38 average	1946	1947	1948	1949	1950	1951
A. TOTAL CROP PRODUCTION							
1. Million crowns:							
at 1936 prices	22,290	18,366	12,591	18,793	20,068	19,393	20,215
2. " 1948 "	69,219	57,744	39,142	59,079	62,718	61,152	63,655
3. " 1956 "	19,424	16,238	11,117	16,680	17,725	17,131	18,043
4. Index numbers:							
at 1936 prices	100.0	82.4	56.5	84.3	90.0	87.0	90.7
5. " 1948 "	100.0	83.4	56.5	85.3	90.6	88.3	92.0
6. " 1956 "	100.0	83.6	57.2	85.9	91.2	88.2	92.9
B. TOTAL ANIMAL PRODUCTION							
7. Million crowns:							
at 1936 prices	13,172	8,627	7,855	8,847	10,503	11,435	11,305
8. " 1948 "	62,130	39,558	36,524	40,868	48,944	54,203	53,190
9. " 1956 "	17,376	11,236	10,290	11,515	13,730	15,056	14,869
10. Index numbers:							
at 1936 prices	100.0	65.5	59.6	67.2	79.7	86.8	85.8
11. " 1948 "	100.0	63.7	58.8	65.8	78.8	87.2	85.6
12. " 1956 "	100.0	64.7	59.2	66.3	79.0	86.6	85.6
C. TOTAL CROP AND ANIMAL PRODUCTION							
13. Million crowns:							
at 1936 prices	35,462	26,993	20,446	27,640	30,571	30,828	31,520
14. " 1948 "	131,349	97,302	75,666	99,947	111,662	115,335	116,845
15. " 1956 "	36,800	27,474	21,407	28,195	31,455	32,187	32,912
16. Index numbers:							
at 1936 prices	100.0	76.1	57.7	77.9	86.2	86.9	88.9
17. " 1948 "	100.0	74.1	57.6	76.1	85.0	87.8	89.0
18. " 1956 "	100.0	74.6	58.2	76.6	85.5	87.5	89.4
D. RELATIVE SHARE OF TOTAL CROP AND ANIMAL PRODUCTION							
19. Crop production:							
at 1936 prices	62.9	68.0	61.6	68.0	65.6	62.9	64.1
20. " 1948 "	52.7	59.3	51.7	59.1	56.2	53.0	54.5
21. " 1956 "	52.8	59.1	51.9	59.2	56.4	53.2	54.8
22. Animal production:							
at 1936 prices	37.1	32.0	38.4	32.0	34.4	37.1	35.9
23. " 1948 "	47.3	40.7	48.3	40.9	43.8	47.0	45.5
24. " 1956 "	47.2	40.9	48.1	40.8	43.6	46.8	45.2
E. OFFICIAL CZECHO-SLOVAK INDEX AT 1955 PRICES^a							
25. 1936=100; Total crop product.	100.0	..	..	79.6	84.3	82.2	85.8
26. 1936=100; Total animal product.	100.0	..	..	68.1	82.5	94.3	91.9
27. 1936=100; Total crop & animal production	100.0	..	..	74.8	83.5	87.3	88.3
28. Share of total crop. product.	58.3	..	..	62.0	58.8	54.9	56.6
29. Share of total animal product.	41.7	..	..	38.0	41.2	45.1	43.4

^aStat. roc., 1961, p. 230, Ibid., 62, p. 220.

*Sources: Physical quantity of crops and animal products, from Tables 3 and 4 respectively, is valued at constant 1936, 1948 and 1956 prices paid to producers. The prices paid to producers are from Tables 5 and 6.

1936, 1948, AND 1956 PRICES PAID TO FARMERS (1934-38 = 100)*

	<u>1952</u>	<u>1953</u>	<u>1954</u>	<u>1955</u>	<u>1956</u>	<u>1957</u>	<u>1958</u>	<u>1959</u>	<u>1960</u>	<u>1961</u>
1.	18,551	21,887	19,264	22,109	22,692	21,287	21,585	20,914	22,520	21,544
2.	57,632	69,088	61,427	70,433	70,920	67,234	69,704	65,448	72,388	68,210
3.	16,244	19,514	17,460	20,045	20,150	19,049	19,794	18,693	20,694	19,512
4.	83.2	98.2	86.4	99.2	101.8	95.5	96.8	93.8	101.0	96.6
5.	83.3	99.8	88.7	101.8	102.5	97.1	100.7	94.6	104.6	98.5
6.	83.6	100.5	89.9	103.2	103.7	98.1	101.9	96.2	106.5	100.5
7.	11,839	9,901	10,836	11,758	12,418	12,607	12,849	13,249	13,314	13,666
8.	55,944	46,607	51,264	55,853	59,258	60,367	61,410	63,616	63,655	65,369
9.	15,570	12,961	14,202	15,457	16,357	16,626	16,816	17,550	17,556	18,038
10.	89.9	75.2	82.3	89.3	94.3	95.7	97.5	100.6	101.1	103.7
11.	90.0	75.0	82.5	89.9	95.4	97.2	98.8	102.4	102.5	105.2
12.	89.6	74.6	81.7	89.0	94.1	95.7	96.8	101.0	101.0	103.8
13.	30,390	31,788	30,100	33,867	35,110	33,894	34,434	34,163	35,834	35,210
14.	113,576	115,695	112,691	126,286	130,178	127,601	131,114	129,064	136,043	133,579
15.	31,814	32,475	31,662	35,502	36,507	35,675	36,610	36,243	38,250	37,550
16.	85.7	89.6	84.9	95.5	99.0	95.6	97.1	96.3	101.1	99.3
17.	86.5	88.1	85.8	96.1	99.1	97.1	99.8	98.3	103.6	101.7
18.	86.5	88.2	86.0	96.5	99.2	96.9	99.5	98.5	103.9	102.0
19.	61.0	68.9	64.0	65.3	64.6	62.8	62.7	61.2	62.8	61.2
20.	50.7	59.7	54.5	55.8	54.5	52.7	53.2	50.7	53.2	51.1
21.	51.1	60.0	55.1	56.5	55.2	53.4	54.1	51.6	54.1	52.0
22.	39.0	31.1	36.0	34.7	35.4	37.2	37.3	38.8	37.2	38.8
23.	49.3	40.3	45.5	44.2	45.5	47.3	47.8	49.3	46.8	48.9
24.	48.9	40.0	44.9	43.5	44.8	46.6	45.9	48.4	45.9	48.0
25.	76.2	92.4	83.0	93.5	92.8	89.2	93.3	89.0	98.3	94.5
26.	96.1	80.5	89.1	97.4	103.8	107.4	107.7	111.1	112.4	113.3
27.	84.5	87.5	85.5	95.1	97.4	96.8	99.3	98.2	104.2	103.1
28.	52.6	61.6	56.6	57.3	55.6	53.7	54.8	52.8	55.0	49.6
29.	47.4	38.4	43.4	42.7	44.4	46.3	45.2	47.2	45.0	50.4

There are two positive effects: greater quantity weights in 1960 than in the base period and relatively higher price weights in 1948--and still higher in 1956--than in 1936 for the above-named crops. For the other years, the differences between indexes obtained by using different price weights are much smaller, amounting only to a fraction of one per cent for most years. Examination of the table will show that in general the index calculated by using the 1936 price weights is lower than that calculated by using the 1948 price weights. The index calculated by using 1956 price weights is, in turn, higher (except for 1950) than that calculated by using 1948 price weights. The 1948 and 1956 indexes were closer to each other than to the 1936 index (Table 7, items 4-6). Two factors cause this effect. First, the relative increase in production of some series (for example, sugar beets, fibers, oil seeds) was accompanied by price increases which rose relatively faster than those of all crops combined from 1936, 1948, and 1956. Second, the relative decrease in production of some series (i.e., rye, oats, potatoes) since the prewar years was accompanied by slower increases.

The three indexes of total animal production, calculated by using 1936, 1948, and 1956 prices, show very small differences (Table 7, items 10-12). The largest difference is in 1946. The index calculated by 1948 prices is smaller by 2.7 per cent than that calculated by 1936 prices. The large difference in 1946 is due to a large decrease in pig production which had relatively high 1948 price weights. The differences for all other years are insignificant because the relative quantity weights and relative price weights did not change noticeably over the whole period.

The combined indexes of total crop and animal production (Table 7, items 16-18) contain the combined characteristics of the individual indexes of total crop production and total animal production already discussed. As a result, the differences between the over-all indexes calculated in different price weights are smaller than those among the indexes of total crop production, and they are little greater than those among the indexes of total animal production. By using the 1936 price weights, the index of total crop and animal production in 1961 was 99.3 per cent of that in 1934-38; by using the 1948 price weights it was 101.7 per cent; and by using the 1956 price weights it was 102.0 per cent.

It is evident that the alternative use of the 1936, 1948, and 1956 price weights has a negligible effect on the indexes of total crop and animal production. The 1948 price weights seem to have preference because they are not as remote as the 1936 price weights and also because they were set by the state essentially according to prevailing demand and supply conditions and taking into consideration production costs.³⁴

The use of different price weights does, however, markedly affect the relative share of crop production and animal production in the total. (See Table 7, items 19-24). Using the 1936 price weights, the share of total crop production amounts to between sixty to sixty-five per cent of the total for most years. Using the 1948 and 1956 price weights, however, the share of

³⁴Stat. zpravodaj, 1950, No. 2, pp. 53-56. (See also section 6-2 above.)

total crop production ranges between fifty to fifty-five per cent of the total for most years. Thus, the 1936 price weights apparently would overvalue the share of crop production by about twenty per cent in relation to the 1948 and 1956 weights. The reason for this is that the prices of crops were relatively higher than those of animal products before the war than after the war; the existence of the grain monopoly held crop prices at a level higher than market prices (see Chapter I). Although the relative shares change greatly from year to year because of changing crop yields, there does not seem to be any significant decline or increase in the share of either crop or animal production over the whole period under study.

2. Comparison and Evaluation of Indexes in this Study with the Official Czechoslovak Indexes

The Czechoslovak State Statistical Office publishes an index under the name "gross agricultural production" (hruba zemedelska vyroba) which has approximately the same commodity coverage, with only small differences, as our definition of total crop and animal production. The official index includes the production of flowers³⁵ since 1955, which is omitted in this study because no data are available for the earlier period. The official index also includes fishing, which is not covered in this study because the United Nations International Standard Industrial Classification of All Economic Activities³⁶ treats fishing as an independent major group. The inclusion of fishing in the official index does not affect the results to any significant degree because it accounts only for 0.1 per cent of the total crop and animal production.³⁷ The official index is calculated in average prices received for the year July 1, 1955-June 30, 1956. The base period of the index is 1936. Although the base period and the price weights of the official index differ somewhat from the indexes in this study, rough comparison is possible after taking into account these differences.

The official index of total crop and animal production is lower than our index for all years, but the average difference for all years is only 1.4 per cent between the official index and our index based on 1956 price weights. For total crop production, however, the official index is 8.4 per cent lower and for total animal production it is 7.2 per cent higher than our index (Table 7, items 6, 12, 18 and 25-27). The official calculation of the share of total crop production is 3.3 per cent higher and of total animal production is 3.8 per cent lower than the share which was weighted in the 1956 prices in this study (Table 7, items 21, 24, 28-29).

The reasons for these differences are to be found in differences in the base period and in the price weights. The base year for the official index is

³⁵State. obzor, 1958, No. 4, p. 153.

³⁶United Nations Statistical Office, Statistical Papers, Series M, No. 4, Rev. 1, New York, 1958, p. 6.

³⁷Stat. obzor, 1958, No. 4, p. 153.

1936. In that year crop production was well above the average of the years 1934-38³⁸ which resulted in a higher base for the official data. Animal production in 1936 was lower than the 1934-38 average which resulted in a lower base for the official data than for our data.³⁹ Thus the official index of crop production is lower and that of animal production is higher than our index based on the 1934-38 average. In the combined official index of total crop and animal production these divergencies are largely offset. The official index for the whole period averages 1.6 per cent lower than our index because the downward effect of the index of total crop production is stronger than the upward effect of the index of total animal production.

The smaller share of animal production for the official data than for our data can be explained by the difference in price weights. The 1955 price weights for animal production, used in official data, are lower for most series than the 1956 price weights used in our data.⁴⁰

Comparisons of the official indexes with indexes constructed in this study suggest that there are no significant differences between these two indexes, apart from those resulting from differences in the base period and in the price weights. The method of calculation of the official index is not known in detail, but the available literature⁴¹ indicates that the method may be close to the one adopted in this study.

There are official data on the value of crop and animal production in crowns per person employed in agriculture for 1956. This data is expressed in 1955 prices received by farmers. It will be useful to check this information against our data. In 1956 the total crop and animal production per person employed in agriculture amounted to 17,950 crowns valued in 1955 prices received by farmers.⁴² Revalued in 1956 prices,⁴³ the total crop and animal production per person employed in agriculture was 18,722 crowns in 1956, taking 1955 as a base for the price index; taking 1937 as a base for the price

³⁸Stat. roc., 1937, pp. 41-42; and ibid., 1938, pp. 39-40.

³⁹Ibid., 1937, pp. 46-49; and ibid., 1938, pp. 46-49.

⁴⁰Ibid., 1958, p. 330.

⁴¹Stat. obzor, 1956, No. 12, pp. 533-42; ibid., 1957, No. 1, pp. 16-20; and ibid., 1957, No. 6, pp. 282-86.

⁴²Politicka ekonomie, 1958, No. 2, p. 105.

⁴³The index of prices received by farmers increased by 4.3 per cent between 1955 and 1956 taking 1955 as the base, and it increased by 6.2 per cent taking 1937 as the base (Stat. roc., 1958, p. 330).

index, it was 19,065 crowns. There were 1,898,000 persons employed in agriculture in 1956.⁴⁴ Total crop and animal production for the whole country was 35,534 million crowns in 1956 at current prices, taking 1955 as a base for the price index, and 36,185 million crowns taking 1937 as a base. Thus the official data are 2.7 per cent lower, if the base for the price index is 1955, and only 0.9 per cent lower, if the base for the price index is 1937, then the data in this study (Table 7, item 15, col. 13). The difference is not large and is due to the use of lower price weights for certain products in the official data than the price weights used in this study.⁴⁵ The physical quantities and the price weights from which official indexes and our indexes of total crop and animal production were calculated cannot, therefore, differ significantly.

As already explained, total crop and animal production arrived at in this chapter involves duplication in the form of double-counting intermediate products and cannot be used as a measure of final output available for human consumption and other sectors outside of agriculture. In the next chapter an attempt is made to eliminate the intermediate products from total crop and animal production to obtain a more useful measure of agriculture's capacity to produce end-use products. This measure we shall call "agricultural output."

⁴⁴Ibid., 1958, p. 89.

⁴⁵The difference is due mainly to a higher price for manure used in our study, namely, 5.50 crowns per ton as opposed to 3.00 crowns used by the State Statistical Office. The official figures value manure 647 million crowns lower than our figure, which is based on the cost of production. The official price is arbitrary (Zem. ekon., 1958, No. 9, pp. 641-53).

CHAPTER III

AGRICULTURAL OUTPUT

This chapter defines the concept of agricultural output and the methods used to derive it by eliminating the double counting of "intermediate products," mentioned as a limitation of the measure of total crop and animal production developed in the previous chapter.

A. Concept and Purpose

1. Definition of the Concept

The concept "agricultural output" is defined technically as "end-use output from the national farm, plus changes in stocks, and 'work in progress' on the farm."¹ This definition accounts for total sales of agricultural products to other sectors and also for output which never leaves the farm (direct human consumption of agricultural products on the farm). A more specific breakdown of various categories of output in agriculture is given below.

The total sales to other sectors include sales to purchasing agencies (state, cooperative, and private) plus direct sales to consumers. Inter-farm sales are excluded from sales. Some products, temporarily sold to other sectors, are later re-employed in agriculture production. Examples of such products are: milling offals produced from grain which is sold back to the agricultural sector for use in further production; oilcake made from oilseeds sold by agriculture and then bought back for feeding livestock; pulp; brewers' by-products; and skim milk. Such products are excluded from total sales and

¹OEEC, The Measurement of Agricultural Production and Food Consumption, Paris, 1955, p. 15. The term "end-use output" means that the product reached its final form in the agricultural sector. It may be an intermediate product for other industries, for example, milk delivered to the dairy industry for processing; also United Nations, Economic Commission for Europe and FAO, Agricultural Sector Accounts and Tables, A Handbook of Definitions and Methods, Geneva, December, 1956, p. 11.

hence from output.²

Direct consumption in farm households or consumption in kind is given an imputed value and is included in sales.

Changes in stock refers to changes in livestock inventory between January 1 to December 31 of each year.

No account has been taken of changes of work in progress (fodder crops awaiting consumption on the farm or ripening crops not yet gathered) because of non-availability of data (see Chapter II, B.1.).

Miscellaneous output includes the output of all goods and services inseparably connected with the activity of the agricultural sector not already included in the output of crops and animal products, such as farm forest products, peat, processing of farm products into finished products on farms (e.g., butter and cheese), transport services provided by agriculture to non-agricultural sectors (e.g., hauling work by farmers), and rights leased to other sectors (e.g., hunting right).

Farm investment in kind is the value of labor, performed by farmers and their families and friends, to produce durable producers' goods, fixed equipment, development of orchards, hop-gardens, and vineyards on farms.

These definitions are those elaborated by the U.N. Economic Commission for Europe and the FAO and used by them to calculate agricultural output³ in

² Another way of treating the part of products sold and then reemployed in agricultural production would be to include it in output and then count it as an expense on the input side. The treatment adopted in this study is the direct exclusion from the value of output of products bought back by farms. Thus, these products are treated as intermediate products which enter into output only when they become end-products (milk, meat, etc.). This treatment gives a more "purified" output actually available for other sectors outside of agriculture. However, both methods result in the same net product (U.N., Agricultural Accounts, op. cit., p. 27).

³ National statistics of many countries denote the above concept as "gross agricultural output." Another measure widely used is the "net agricultural output," which is the same concept as defined above, except that the imported feedstuffs, seed, livestock for fattening and breeding, and feedstuffs derived from imported raw materials, are deducted. This measure is useful when the output of many countries is combined into one measure to eliminate double counting resulting from imports. From the point of view of national accounting, this concept has little meaning because it does not take into account the agriculture sector's purchases from other sectors, including imports of non-agricultural origin. Also it can be easily confused with the net product of agriculture. For these reasons, the concept of "net" output will not be used in this study. The word "gross," then, is superfluous and will be omitted (U.N. Agricultural Accounts, op. cit., p. 12).

western European countries. The U.S. Department of Agriculture uses a similar concept under the term "farm output,"⁴ differing from the one used in this study only in that it omits the miscellaneous output and the farm investment in kind.⁵ The Czechoslovak official statistics have not hitherto used the concept of agricultural output in this sense.

2. Purpose

Agricultural output, as defined above, is a measure of the year-to-year physical volume of agricultural production available for eventual human and industrial use and provides a basis for calculating the net product of agriculture (see Chapter V). Agricultural output data also provide the basis for the calculation of food consumption of the nation after export and import adjustment. Knowledge of output is necessary to determine the degree of self-sufficiency in food of a nation and the eventual amount of surplus available for export or for industrial use of food and of non-food products (i.e., fibers, wool, etc.).

B. Methods of Estimating the Output of Agriculture

1. Derivation of Agricultural Output in Physical Units

Agricultural output can be calculated by subtracting from total crop and animal production all intermediate products utilized on farms in further production.⁶ The total crop and animal production is known (Chapter II). Estimates of intermediate produce are given in Appendix D and supporting tables. The methods of estimation are outlined briefly below.

The intermediate produce of agriculture consists of feed, litter, manure, seed, and inventory losses. It also includes that part of produce which was sold to other sectors but later returned to farms in the form of

⁴U.S. Department of Agriculture, Agricultural Statistics, 1952, op. cit., p. 661. Harold Barger and Hans H. Landsberg use the term "net output" for farm output (American Agriculture 1899-1939: A Study of Output, Employment and Productivity, New York, NBER, 1942, pp. 12-13).

⁵These two items amount to 4.6 per cent of the Czechoslovak agricultural output (Table 10, items 40-45) and they may be a much lower fraction of output in the United States.

⁶In many countries the output is obtained directly by the summation of total sales of agricultural products to other sectors, plus consumption in farm households, plus changes in stock and investment in kind (U.N. Agricultural Accounts, op. cit., p. 11). Because of non-availability of data on total sales, this method could not be used for Czechoslovakia.

by-products of food industry (e.g., milling offals and oilcake).

The estimation of the part of produce utilized as feed for farm animals was made on the basis of information available in technical literature concerning the feed requirements of different kinds of farm animals at various ages and levels of productivity. Many products are used exclusively as feed (forage, hay, pasture, feed grain, straw for feed, sugar-beet leaves, pulp, milling offals, and oilcake) and thus, excluded, by definition, from agricultural output. For each product used partly as animal feed, the share fed to animals was estimated on the basis of information available on human consumption, industrial use, and animal feed. For a few multiple-use products, data were not available for all years and the estimates are less reliable.

Total production of litter and manure is considered as intermediate produce and also excluded from output. Seed utilization on individual farms from their own production was estimated on the basis of each year's area sown for each crop and the requirement of seed per hectare of area sown for that crop. The production of some seeds is separately recorded (grass seed, root-crop seed, sugar-beet seed, etc.). The estimates of seed usage are fairly accurate because of the availability of figures as to the area sown for each year and the requisites of seed per hectare.

Farm losses incurred during storage are calculated only for feed. Estimates have been made for the sake of completeness. Losses incurred during storage of agricultural products while awaiting human consumption or industrial use are not considered as farm losses and are not charged to the agricultural sector.

Products returned to farms as by-products of previously sold products were estimated on the basis of average yields of such by-products per unit of processed product or the extraction coefficients most commonly used.

Although some estimates of intermediate products for some years are arbitrary, the overall figures probably are not affected significantly, since these estimates account for a small part of the total. The quantities of all intermediate products are given in Table 8.⁷

To obtain the output of each crop and animal product in physical quantities, the quantity of each crop and animal product listed as an intermediate product in Table 8 was deducted from the total production of each item in Tables 3 and 4. The results, given in Table 9, show the output of all crops and animal products available for human consumption or industrial use.

2. Calculation of Agricultural Output in Comparable Units.

The output of individual crops and animal products given in Table 9 in physical units have been aggregated by valuing them at weighted average prices

⁷ For the detailed calculation and sources see Appendix D.

Table 8

INTERMEDIATE PRODUCE OF AGRICULTURE UTILIZED ON FARMS TO FURTHER
PRODUCTION INCLUDING FARM LOSSES, 1934-38 AVERAGE AND 1946-1961*

(Thousand metric tons unless specified)

<u>Item</u>	<u>1934-38 average</u>	<u>1946</u>	<u>1947</u>	<u>1948</u>	<u>1949</u>	<u>1950</u>
A. DIRECT UTILIZATION ON FARMS:						
1. Wheat	268	245	216	246	249	237
2. Rye	249	190	176	180	176	154
3. Barley	694	596	485	651	683	673
4. Oats	1,176	800	693	964	1,030	868
5. Corn	209	190	124	276	223	203
6. Edible pulses	7	4	4	5	5	5
7. Colza and rape	-	..	..	..	..	..
8. Poppy	..	..	..	..	..	..
9. Sugar beets	205	191	106	189	188	277
10. Potatoes	7,325	7,080	3,624	4,634	4,058	6,183
11. Root crops	4,653	4,323	2,040	3,820	3,551	3,462
12. Forage-crops	3,863	2,412	1,563	3,363	4,786	3,247
13. Hay from meadows	4,017	2,484	1,799	2,937	3,678	2,640
14. Feed pulses, incl. millet, buckwheat	110	80	58	95	98	79
15. Pasture	3,195	1,779	1,338	2,475	2,973	2,328
16. Straw for litter	5,357	4,322	3,205	4,525	5,054	4,495
17. Straw for feed	3,325	2,344	1,980	2,859	3,036	2,799
18. Pulses straw	217	157	111	190	194	153
19. Sugar-beet leaves	2,332	2,171	1,204	2,148	2,142	3,148
20. Other root-crop leaves	1,821	1,753	812	1,606	1,431	1,416
21. Flaxseed	2	2	4	4	4	5
22. Hempseed	1	1	..	..	..	1
23. Soybean	-	..	..	..	..	..
24. Mustard	-	..	..	..	..	..
25. Sugar-beet seed	5	3	1	3	5	7
26. Root-crop seed	2	2	1	2	2	2
27. Forage-crop seed	20	12	8	17	24	16
28. Grass seed	3	2	2	2	3	2
29. Sunflower seed	-	-	-	..	..	..
30. Eggs for hatching, million pieces	26.5	12.6	14.4	16.5	20.6	22.4
31. Milk fed to calves, 1000 hectoliters	3,982	3,425	3,368	3,141	3,125	3,263
32. Manure, mill. metric tons	26.2	24.6	22.4	21.7	24.2	25.9
A. PRODUCTS BOUGHT BACK BY FARMERS:						
33. Milling offals, total	737	572	417	613	698	628
34. Oilcake	8	14	9	12	17	15

*Sum of respective items from Table A-16, Table A-17, and Table A-18. Sources and notes are in Appendix D, Notes to Table A-16 for feed, litter and manure; Notes to Table A-17 for seed; and Notes to Table A-18 for farm losses.

	<u>1951</u>	<u>1952</u>	<u>1953</u>	<u>1954</u>	<u>1955</u>	<u>1956</u>	<u>1957</u>	<u>1958</u>	<u>1959</u>	<u>1960</u>	<u>1961</u>
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1.	245	249	241	209	237	246	244	227	238	225	237
2.	149	139	139	129	138	143	134	131	124	125	131
3.	723	674	803	666	816	894	828	682	896	1,132	948
4.	901	899	843	840	945	1,003	872	845	901	989	930
5.	281	197	400	355	364	358	414	445	468	532	429
6.	6	6	7	6	5	5	4	4	4	4	4
7.	..	..	..	..	..	..	..	-	-	1	1
8.	..	..	..	..	..	..	..	-	-	-	-
9.	229	209	246	247	271	194	298	300	218	367	303
10.	5,382	5,848	7,483	6,175	5,823	7,367	6,420	4,661	4,456	3,300	3,435
11.	3,434	3,212	3,952	3,631	4,210	3,043	3,572	3,204	2,641	3,585	2,618
12.	4,434	3,597	4,007	4,207	5,693	5,257	4,759	5,712	5,559	5,806	6,188
13.	3,933	2,706	2,982	2,805	3,980	3,969	3,464	3,746	3,595	3,031	3,216
14.	96	88	103	111	133	109	85	89	93	113	116
15.	3,415	2,323	2,521	2,330	3,065	3,064	2,772	2,996	2,757	2,407	2,586
16.	4,527	4,467	4,567	3,587	4,608	4,831	4,542	4,302	4,879	4,538	4,977
17.	3,100	2,972	3,325	3,086	3,469	3,692	3,534	3,329	3,786	4,358	3,919
18.	193	167	210	216	250	204	154	159	167	206	209
19.	2,602	2,380	2,794	2,802	3,076	2,202	3,388	3,473	2,473	4,184	3,447
20.	1,409	1,349	1,683	1,539	1,738	1,320	1,519	1,415	1,194	1,579	1,220
21.	8	8	7	7	7	7	7	7	7	6	6
22.	1	1	1	1	1	1	1	1	1	1	1
23.	..	..	..	..	..	..	..	-	-	-	-
24.	..	..	..	..	..	-	-	-	-	-	-
25.	11	10	12	14	19	12	16	22	14	11	7
26.	2	2	2	2	2	1	2	1	1	2	1
27.	23	18	20	21	29	27	24	29	28	30	32
28.	3	2	2	2	3	3	3	3	3	2	3
29.	..	..	..	..	..	..	..	-	-	-	-
30.	23.2	23.8	26.5	27.1	29.1	30.5	31.5	32.0	34.0	37.0	38.0
31.	3,459	3,587	3,706	3,594	3,500	3,480	3,459	3,450	3,474	3,460	3,418
32.	26.5	26.9	26.3	25.2	25.5	25.8	25.6	25.7	26.1	26.2	26.5
33.	611	615	623	472	610	651	619	568	666	627	682
34.	32	22	27	25	39	41	31	38	51	46	56

Table 9

OUTPUT OF CROPS AND ANIMAL PRODUCTS - QUANTITY

1934-38 AVERAGE AND 1946-1961*

(Thousand metric tons unless specified)

<u>Item</u>	<u>1934-38 average</u>	<u>1946</u>	<u>1947</u>	<u>1948</u>	<u>1949</u>	<u>1950</u>
A. CROPS:						
1. Wheat	1,245	1,075	638	1,182	1,307	1,193
2. Rye	1,328	946	819	963	1,140	993
3. Barley	415	170	184	247	340	357
4. Oats	36	25	21	30	32	27
5. Corn	16	14	9	21	17	15
6. Millet & buckwheat	3	2	2	3	3	2
7. Edible pulses	31	22	13	28	28	19
8. Potatoes	2,310	2,079	1,054	1,433	1,714	1,973
9. Sugar beets	4,459	4,150	2,301	4,106	4,094	6,019
10. Colza and rape	7	15	9	4	18	20
11. Poppy	12	12	9	13	11	7
12. Flaxseed	4	6	2	6	5	-
13. Hempseed	2	3	2	3	1	..
14. Soybean	1	1	1	2	2	2
15. Sunflower	1	2	2	5	5	5
16. Mustard	..	6	5	16	14	11
17. Grapes	66	110	82	66	55	70
18. Fruits	465	559	538	637	609	633
19. Vegetables	748	884	371	952	687	736
20. Flax, raw stalks	45	51	30	54	58	35
21. Hemp, raw stalks	28	28	13	24	16	9
22. Hops	9	5	5	5	4	5
23. Tobacco	11	9	7	9	6	6
24. Chicory	68	57	26	50	58	53
25. Pepper, kumin, aromatic, medical and other industrial crops	8	10	6	9	10	11
B. ANIMAL PRODUCTS:						
26. Cattle, live weight	289	322	435	196	197	294
27. Calves, live weight	51	44	46	28	22	40
28. Pigs, live weight	416	178	244	216	299	462
29. Sheep, live weight	5	4	7	3	2	3
30. Goats, live weight	5	3	5	2	2	2
31. Horses, live weight	13	19	27	10	9	22
32. Poultry, live weight	51	30	37	34	41	45
33. Rabbits, live weight	19	24	24	24	24	24
34. Eggs, million pieces	1,872	763	889	1,092	1,362	1,585
35. Cow milk, 1000 hl.	42,914	25,699	23,445	21,902	25,426	28,469
36. Sheep milk, 1000 hl.	292	226	188	179	238	285
37. Goat milk, 1000 hl.	5,236	4,471	3,559	3,289	3,896	4,072
38. Wool, greasy basis, tons	880	960	841	810	950	1,083
39. Feather, unstripped, tons	1,347	1,274	1,346	1,251	1,328	1,437
40. Honey, tons	3,650	850	1,817	1,062	1,532	3,004
41. Beeswax, tons	154	63	105	92	103	143
B. LESS: PRODUCTS BOUGHT BACK						
42. Milling offals	737	572	417	613	698	628
43. Oilcake	8	14	9	12	17	15

*Data in this Table is the sum of crop and animal production from Tables 3 and 4, minus the intermediate produce utilized on farm, from Table 8, items 1-33.

	<u>1951</u>	<u>1952</u>	<u>1953</u>	<u>1954</u>	<u>1955</u>	<u>1956</u>	<u>1957</u>	<u>1958</u>	<u>1959</u>	<u>1960</u>	<u>1961</u>
1.	1,231	1,324	1,315	898	1,236	1,296	1,281	1,119	1,411	1,278	1,429
2.	866	791	815	674	830	907	814	806	843	772	863
3.	420	463	444	449	475	514	534	517	571	613	633
4.	30	28	26	26	29	31	27	26	28	31	29
5.	21	15	30	27	27	27	31	34	35	40	32
6.	3	3	3	3	4	3	3	3	3	4	4
7.	27	18	30	27	29	24	14	14	16	21	21
8.	1,974	2,076	2,219	2,139	2,082	2,268	2,336	1,928	1,878	1,793	1,896
9.	4,974	4,551	5,342	5,356	5,881	4,211	6,477	6,646	4,728	8,001	6,591
10.	42	30	26	21	43	48	39	48	73	55	83
11.	6	7	9	9	8	8	6	5	8	15	13
12.	5	3	8	9	11	15	7	11	10	14	13
13.	1	1	2	2	3	3	2	2	2	3	2
14.	2	2	4	3	4	2	2	1	1	2	1
15.	7	6	11	11	11	7	8	8	7	9	3
16.	11	7	6	5	4	4	2	2	2	7	3
17.	74	34	35	68	72	34	70	93	49	56	62
18.	438	315	721	535	483	571	356	774	397	829	491
19.	730	791	1,011	907	930	849	923	976	868	1,079	992
20.	93	73	97	109	141	143	100	129	123	134	134
21.	16	14	20	23	40	35	32	32	32	37	32
22.	5	4	6	5	6	5	5	7	6	7	6
23.	8	9	12	11	13	10	9	8	6	5	5
24.	68	48	92	84	80	71	67	68	77	78	55
25.	17	14	29	29	30	25	25	25	27	27	21
26.	291	302	296	267	272	293	312	314	323	347	360
27.	34	42	48	42	42	42	45	36	30	30	24
28.	340	397	356	381	455	523	543	542	550	552	578
29.	4	5	6	6	7	8	9	9	9	8	6
30.	2	2	2	2	2	2	2	2	1	1	1
31.	27	15	16	8	8	8	22	40	43	37	25
32.	46	47	53	53	57	59	60	64	70	72	73
33.	24	24	17	11	4	4	4	4	4	4	5
34.	1,745	1,693	2,014	1,724	1,705	1,870	2,024	2,038	2,101	2,230	2,313
35.	31,021	31,203	27,759	28,069	30,652	32,517	32,834	33,059	33,101	33,687	34,848
36.	364	452	452	481	519	535	511	479	433	394	372
37.	3,990	3,764	3,324	3,449	3,648	3,634	3,442	3,272	3,097	2,989	2,937
38.	1,340	1,711	1,920	1,953	1,935	1,878	1,770	1,638	2,900	2,550	2,320
39.	1,383	1,408	1,552	1,509	1,572	1,501	1,429	1,424	1,562	1,592	1,627
40.	2,665	1,709	2,208	2,561	2,082	2,459	3,430	4,054	6,297	3,367	2,268
41.	115	99	97	55	88	83	89	136	150	96	78
42.	611	615	623	472	610	651	619	568	666	627	682
43.	32	22	27	25	39	41	31	38	51	46	56

received by producers (farmers) for the sale of each product.⁸ The same sets of price weights were used as were used for total crop and animal production (Chapter II, C. 2.), namely: 1936, 1948, and 1956 weighted average prices received by farmers given in Tables 5 and 6. The output of each crop and animal product is weighted alternatively in 1936, 1948, and 1956 prices. The value of agricultural output according to major groups of products in 1936, 1948, and 1956 prices is given in Table 10 for 1934-38 average and 1946-61.

Changes in livestock, miscellaneous output, and farm investment in kind have been added to these figures to arrive at the total output of agriculture. Changes in livestock are valued at prices received by farmers for the marketed share of each respective product.⁹ No complete quantitative data were available on miscellaneous output and farm investment in kind. Miscellaneous output was estimated at two per cent of the total output of crops and animal products, and farm investment in kind at 2.6 per cent of the same on the basis of the scanty information available for 1954 and 1955. In estimating these two items, their respective share of the total output in other countries with similar agricultural conditions (Federal Republic of Germany and Austria) served as a check for our estimates (Appendix D, II).

3. Calculation of Indexes of Agricultural Output

The real values of output given in Table 10, when expressed in relatives of the base period 1934-38, yield indexes of agricultural output.

The formula used for the calculation of these indexes is the modified Laspeyres' Formula used also in calculation of indexes of total crop and animal production (Chapter II, C. 2.). Again, the base period is the 1934-38 average. All problems concerning the price weights, base and quantities discussed in Chapter II apply to the indexes of agricultural output.

C. Results and Evaluation

1. Results

Index numbers of changes in the values of the same major groups of products as in Table 10 are given in Table 11, in terms of 1948 price weights. The base period is always the 1934-38 average.

The effect of price weights on magnitudes of output indexes is significant for some series. The largest differences are to be found in the oilseeds series. The group of fibers, hops, tobacco, chicory, pepper, aromatic and medical crops also shows significant differences. The reason for large differences between oilseed output indexes based on 1948 weights and those based on 1936 and 1956 weights can be found in relatively higher price weights

⁸ Stat. roc., 1958, pp. 320 and 330; and Stat. zpravodaj, 1950, No. 2, pp. 53-54.

⁹ For example, changes in live weight of pigs are valued at prices received per unit of live weight for marketed pigs.

in 1948 of certain oilseeds whose output increased greatly from prewar years (colza and rape, soybean, and sunflower). In the second group (fibers, hops, tobacco, and chicory) the 1956 price weights were relatively higher than the 1936 and 1948 price weights.

The erratic year to year behavior of the oilseed group and fiber group indexes can be ascribed to large yearly changes in the production of individual crops (Table 3, items 7-9, 15, 16, 21-29) and greater than average changes in relative price weights between 1936, 1948, and 1956 for these crops (Table 5, items 7-9, 15, 16, 21-29).

In the early postwar years, especially since the sharp decline of foreign trade with the Western European and overseas countries due to the cold war which gained ground in 1949, the Czechoslovak government was encouraging the domestic expansion of production of oilseeds and fibers, which were hitherto largely imported from overseas countries. However, climatic conditions and most of the soil are not very suitable for these crops. In addition, the highly required skill for successful production was not available. As a result, the yields and production of individual crops fluctuated substantially.

To provide the incentives in the expansion of production, the government set the prices for some crops (colza and rape, tobacco, flaxseed, hempseed, soybean and sunflower) substantially above the average increase of agricultural prices since the prewar period.¹⁰ These administrative manipulations of production and prices are reflected in an uneven behavior of the output indexes of oilseed and fiber groups.

The differences in indexes calculated with various weights used for all other groups are much smaller, which suggests that there are no great differences in relative prices within these groups in the three weight periods.

Differences in price weights, however, have little effect on the indexes of total agricultural output because the differences within groups are largely eliminated by the process of aggregation. All three indexes differ from each other by less than 0.3 per cent for the average of all years, although year-to-year differences are larger.

The percentage distribution of output by major commodity groups is also affected by the choice of price weights. The share of cereals in the total output weighted by 1936 prices is 22.1 per cent for the average of all years, but it is only 13.0 and 13.8 per cent by using the 1948 and 1956 price weights respectively. The higher share at 1936 prices is the result of relatively higher prices of grain in relation to animal products in the prewar years than in the postwar period.

For all other groups of products the relative structure of prices within the groups did not change much between the prewar and postwar period. Thus the choice of price weights did not affect greatly their relative share.

¹⁰ While the prices of all agricultural products increased by about four times from 1936 to 1948 (Table 24), the prices of colza and rape, tobacco, and soybean increased approximately eight times for the same period (Table 5).

Table 10

OUTPUT OF AGRICULTURE, 1934-38 AVERAGE AND 1946-1961 VALUED AT CONSTANT 1936,
1948 AND 1956 PRICES PAID TO FARMERS* (Million crowns)

Item		1934-38 average	1946	1947	1948	1949	1950
A. CROPS							
1. Cereals & pulses:	at 1936 prices	4,775	3,543	2,589	3,891	4,488	4,068
2. "	at 1948 prices	11,845	8,743	6,448	9,592	11,090	10,063
3. "	at 1956 prices	3,423	2,494	1,838	2,764	3,201	2,912
4. Potatoes & sugar beets:							
	at 1936 prices	1,570	1,430	749	1,140	1,262	1,615
5. "	at 1948 prices	5,862	5,332	2,830	4,474	4,828	6,396
6. "	at 1956 prices	1,437	1,314	696	1,092	1,184	1,559
7. Oilseeds:	at 1936 prices	100	130	95	160	155	112
8. "	at 1948 prices	345	482	330	515	563	431
9. "	at 1956 prices	157	192	136	208	204	145
10. Grapes, fruits, vegetables:							
	at 1936 prices	2,130	2,622	1,964	2,780	2,405	2,556
11. "	at 1948 prices	7,880	9,703	7,278	10,287	8,906	9,464
12. "	at 1956 prices	2,326	2,922	2,187	2,996	2,588	2,774
13. Fibers, hops, tobacco & other:							
	at 1936 prices	427	322	238	311	287	292
14. "	at 1948 prices	1,685	1,267	951	1,238	1,086	1,095
15. "	at 1956 prices	534	442	312	431	396	386
16. Total output of crops:							
	at 1936 prices	9,001	8,048	5,635	8,282	8,598	8,644
17. "	at 1948 prices	27,581	25,527	17,838	26,106	26,473	27,450
18. "	at 1956 prices	7,876	7,364	5,168	7,491	7,573	7,776
19. Final output of crops:							
	at 1936 prices	8,307	7,497	5,236	7,698	7,928	8,042
20. "	at 1948 prices	26,319	24,525	17,112	25,044	25,253	26,354
21. "	at 1956 prices	7,406	6,989	4,897	7,094	7,116	7,367
B. ANIMAL PRODUCTS							
22. Meat:	at 1936 prices	5,075	3,461	4,570	3,002	3,585	5,325
23. "	at 1948 prices	25,897	16,852	22,273	15,177	18,425	27,289
24. "	at 1956 prices	6,838	4,620	6,109	4,050	4,859	7,181
25. Eggs & milk:	at 1936 prices	5,912	3,505	3,238	3,153	3,719	4,167
26. "	at 1948 prices	28,491	16,830	15,581	15,212	17,958	20,129
27. "	at 1956 prices	8,072	4,808	4,430	4,299	5,067	5,673
28. Wool, feather, honey, & wax:							
	at 1936 prices	94	59	71	59	69	92
29. "	at 1948 prices	463	279	341	280	330	449
30. "	at 1956 prices	155	88	110	89	106	148
31. Total output of animal products:							
	at 1936 prices	11,080	7,025	7,879	6,214	7,373	9,584
32. "	at 1948 prices	54,851	33,960	38,194	30,668	36,713	47,867
33. "	at 1956 prices	15,065	9,515	10,649	8,438	10,033	13,002
C. TOTAL OUTPUT OF CROPS & ANIMAL PRODUCTS:							
34. At 1936 prices		19,387	14,522	13,115	13,912	15,301	17,626
35. At 1948 prices		81,170	58,486	55,306	55,712	61,966	74,220
36. At 1956 prices		22,471	16,504	15,546	15,532	17,149	20,369
D. LIVESTOCK CHANGES:							
37. At 1936 prices		231	-108	-1,611	1,112	1,467	82
38. At 1948 prices		947	-165	-7,055	5,051	6,654	415
39. At 1956 prices		290	-127	-2,080	1,430	1,908	153
E. MISCELLANEOUS OUTPUT:							
40. At 1936 prices		388	290	262	278	306	353
41. At 1948 prices		1,623	1,170	1,106	1,114	1,239	1,484
42. At 1956 prices		449	330	311	311	343	407
F. FARM INVESTMENT IN KIND:							
43. At 1936 prices		504	378	341	362	398	458
44. At 1948 prices		2,110	1,521	1,438	1,448	1,611	1,930
45. At 1956 prices		584	429	404	404	446	530
G. TOTAL OUTPUT OF AGRICULTURE:							
46. At 1936 prices		20,510	15,082	12,108	15,664	17,472	18,519
47. At 1948 prices		85,851	61,011	50,795	63,326	71,470	78,049
48. At 1956 prices		23,794	17,137	14,181	17,676	19,846	21,459

*Sources: Output in physical quantity, from Table 9, valued at constant 1936, 1948 and 1956 prices paid to farmers. The prices are from Tables 5 and 6. Livestock changes in physical quantity from Table 4, items 1-10, valued at constant 1936, 1948 and 1956 prices; prices from Table 6, items 1-10. Miscellaneous output is estimated to 2 percent and farm investment in kind to 2.6 of the total output of crops and animal products (items 34-36). The method of estimation is given in Appendix D.

	<u>1951</u>	<u>1952</u>	<u>1953</u>	<u>1954</u>	<u>1955</u>	<u>1956</u>	<u>1957</u>	<u>1958</u>	<u>1959</u>	<u>1960</u>	<u>1961</u>
1.	4,074	4,146	4,195	3,282	4,125	4,378	4,212	3,906	4,539	4,300	4,702
2.	10,042	10,214	10,320	8,108	10,168	10,811	10,410	9,678	11,209	10,622	11,609
3.	2,946	3,001	3,042	2,418	3,003	3,184	3,069	2,854	3,308	3,163	3,442
4.	1,486	1,479	1,640	1,606	1,646	1,521	1,832	1,673	1,413	1,782	1,652
5.	5,727	5,586	6,276	6,183	6,447	5,614	7,155	6,740	5,445	7,436	6,664
6.	1,403	1,373	1,539	1,515	1,574	1,386	1,748	1,638	1,333	1,796	1,618
7.	141	116	137	128	146	154	113	121	168	222	219
8.	678	521	617	571	765	818	602	701	959	1,031	1,152
9.	203	168	206	195	241	257	186	209	288	348	363
10.	2,061	1,711	2,975	2,477	2,379	2,423	2,044	3,222	2,037	3,375	2,439
11.	7,627	6,323	11,008	9,165	8,799	8,964	7,553	11,927	7,533	12,490	9,018
12.	2,272	1,831	3,132	2,688	2,595	2,563	2,246	3,504	2,197	3,587	2,635
13.	391	315	507	504	584	506	454	536	509	547	475
14.	1,461	1,238	1,890	1,868	2,183	1,894	1,668	1,950	1,803	1,918	1,694
15.	562	470	760	766	883	771	684	773	745	782	683
16.	8,153	7,766	9,453	7,997	8,881	8,981	8,655	9,458	8,666	10,226	9,487
17.	25,536	23,883	30,111	25,895	28,360	28,101	27,390	30,996	26,949	33,497	30,137
18.	7,385	6,844	8,680	7,581	8,296	8,161	7,933	8,978	7,871	9,676	8,741
19.	7,542	7,166	8,837	7,524	8,260	8,319	8,037	8,878	7,977	9,581	8,776
20.	24,423	22,788	28,989	25,033	27,228	26,894	26,264	29,938	25,691	32,317	28,838
21.	6,966	6,433	8,258	7,257	7,869	7,705	7,510	8,578	7,395	9,230	8,249
22.	4,485	4,949	4,701	4,657	5,169	5,756	6,058	6,096	6,217	6,350	6,508
23.	22,688	25,182	23,798	23,795	26,599	29,711	31,177	31,347	31,985	32,603	33,528
24.	6,043	6,671	6,328	6,285	6,983	7,781	8,176	8,233	8,405	8,585	8,819
25.	4,511	4,492	4,255	4,158	4,439	4,713	4,800	4,808	4,819	4,928	5,080
26.	21,796	21,700	20,626	20,114	21,448	22,783	23,223	23,265	23,333	23,870	24,610
27.	6,140	6,118	5,768	5,653	6,043	6,412	6,523	6,534	6,546	6,688	6,892
28.	90	85	98	100	97	98	106	112	162	123	106
29.	441	416	480	494	474	484	527	559	823	609	524
30.	146	135	156	162	154	159	176	188	282	203	172
31.	9,085	9,526	9,053	8,916	9,704	10,568	10,964	11,016	11,198	11,401	11,694
32.	44,925	47,297	44,904	44,402	48,520	52,978	54,927	55,171	56,141	57,082	58,662
33.	12,328	12,924	12,253	12,100	13,180	14,352	14,875	14,955	15,233	15,476	15,883
34.	16,628	16,692	17,890	16,440	17,965	18,888	19,002	19,894	19,175	20,982	20,470
35.	69,348	70,085	73,893	69,435	75,749	79,872	81,191	85,109	81,832	89,399	87,500
36.	19,295	19,357	20,511	19,357	21,049	22,057	22,384	23,533	22,628	24,706	24,132
37.	397	452	-990	150	278	61	-138	51	302	97	143
38.	2,147	2,389	-4,507	874	1,345	253	-560	233	2,422	463	565
39.	578	640	-1,280	186	360	75	-170	80	408	124	186
40.	333	334	358	329	359	378	380	398	384	420	409
41.	1,387	1,402	1,478	1,389	1,515	1,597	1,624	1,702	1,637	1,788	1,750
42.	386	387	410	387	421	441	448	471	453	494	483
43.	432	434	465	427	467	491	494	517	499	546	532
44.	1,803	1,822	1,921	1,805	1,969	2,077	2,111	2,213	2,128	2,324	2,275
45.	502	503	533	503	547	573	582	612	588	642	627
46.	17,790	17,912	17,723	17,346	19,069	19,818	19,738	20,860	20,360	22,045	21,544
47.	74,685	75,698	72,785	73,503	80,578	83,799	84,366	89,257	88,019	93,974	92,090
48.	20,761	20,887	20,174	20,433	22,377	23,146	23,244	24,696	24,077	25,966	25,428

Table 11

INDEX NUMBERS OF OUTPUT OF AGRICULTURE FOR MAJOR COMMODITY GROUPS, 1934-38 AVERAGE AND 1946-61 VALUED AT CONSTANT
1948 PRICES PAID TO FARMERS*
(1934-38=100)

I t e m	1934-38 average	1946	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961
A. CROPS:																	
Cereals and pulses	100.0	73.8	54.4	81.0	93.6	85.0	84.8	86.2	87.1	68.4	85.8	91.3	87.9	81.7	94.6	89.7	98.0
Potatoes and sugar beets	100.0	91.5	48.6	76.8	82.9	109.8	98.3	95.9	107.7	106.1	110.6	96.4	122.8	115.7	93.5	126.8	113.7
Oilseeds	100.0	139.6	95.7	149.1	163.2	124.9	196.5	151.0	178.6	165.3	221.5	237.1	174.4	203.1	277.8	298.7	333.7
Grapes, fruits and vegetables	100.0	123.1	92.4	130.6	113.0	120.1	96.8	80.2	139.7	116.3	111.7	113.8	95.9	151.4	95.6	158.5	114.4
Fibers, hops, tobacco and other	100.0	75.2	56.5	73.4	64.4	65.0	86.7	73.5	112.2	110.9	129.5	112.4	98.9	115.7	107.0	113.8	100.5
Total output of crops	100.0	92.5	64.7	94.7	96.0	99.5	92.6	86.6	109.2	93.9	102.8	101.9	99.3	112.4	97.7	121.4	109.3
Final output of crops	100.0	93.2	65.0	95.2	95.9	100.1	92.8	86.6	110.1	95.1	103.5	102.2	99.8	113.8	97.6	122.8	109.6
B. ANIMAL PRODUCTS:																	
Meat	100.0	65.1	86.0	58.6	71.1	105.4	87.6	97.3	91.9	91.9	102.7	114.7	120.4	121.1	123.5	125.9	129.5
Eggs and milk	100.0	59.1	54.7	53.4	63.0	70.7	76.5	76.2	72.4	70.6	75.3	80.0	81.5	81.7	81.9	83.8	86.4
Wool, feather, honey and wax	100.0	60.2	73.6	60.5	71.4	97.0	95.3	89.8	103.6	106.7	102.4	104.5	113.9	120.8	177.8	131.6	113.2
Total output of animal products	100.0	61.9	69.6	55.9	66.9	87.3	81.9	86.2	81.9	80.9	88.5	96.6	100.1	100.6	102.3	104.1	106.9
C. TOTAL OUTPUT OF CROPS AND ANIMAL PRODUCTS:																	
	100.0	72.1	68.1	68.6	96.3	91.4	85.4	86.3	91.0	85.5	93.3	98.4	100.0	104.9	100.8	110.1	107.8
D. TOTAL OUTPUT OF AGRICULTURE:																	
	100.0	71.1	59.2	73.8	83.2	90.9	87.0	88.2	84.8	85.6	93.9	97.6	98.3	104.0	102.5	109.5	107.3

*Source: Calculated from Table 10.

The differences in relative shares of cereals weighted in different prices are reflected to a smaller degree in the relative shares of final output¹¹ of all crops and total output of animal products.

Again, the use of 1936 price weights results in greater share of crop output than the use of either 1948 or 1956 weights because of relatively higher prices of staple crops in prewar period.

The behavior of output by commodity groups and of the whole aggregate can be followed in Table 11. Some significant shifts in output are noticeable. The output of cereals during the postwar years remains some ten to fifteen per cent below the prewar level. The output of sugar beets, oilseeds, fibers and meat expanded greatly between 1934-38 and 1961. However, the total output of agriculture remained below the prewar level during most of the postwar period. It increased from the low of 60 per cent of the 1934-38 output in 1947 to 90 per cent in 1950, decreased to 85 per cent in 1954, and increased to a little above prewar level in 1958-61. The behavior of total output is similar to that of total crop and animal production (Table 7) and this suggests that the intermediate produce is in fairly constant proportion to total production.

2. Evaluation

Unfortunately the results obtained in this chapter cannot be checked against official data because no such data are available. Any shortcomings in estimating intermediate produce are reflected in the resulting measure of total output of agriculture. However, the result of a test indicates that the maximum error in our output data is less than ± 1 per cent. The test was carried out as follows. All estimated series (household gardening, flaxseed, hemp fibers, hempseed, soybean, sunflower, mustard, chicory, medical crops, lamb, horsemeat, rabbit meat, sheep and goat milk, wool, feathers, miscellaneous output and farm investment in kind) were subtracted from total output. The value of these series in which errors were conceivable amounted to about 7 per cent of the total output in 1934-38. The evidence shows that year-to-year fluctuations in output amounted to less than 10 per cent of the total (except for 1947 which was an exceptionally bad harvest year, Table 11). Thus, the maximum error in our estimates (7 per cent of the total output) could not have been greater than 10 per cent (the possible exception is the year 1947). On the basis of the total output the maximum error is reduced to less than ± 1 per cent. The test carried out (calculated from Tables 3-6) showed differences ranging from zero to 0.8 per cent between the total output and the output which excludes the estimates, for all years except 1947. In 1947 the difference amounted to 2.5 per cent.

Technical literature and abundant information on procedures used and problems encountered in the calculation of output in other countries (i.e., west Europe and the United States) were helpful in deriving an acceptable measure of the Czechoslovak agricultural output.

¹¹ Final output = total output minus products bought back by farmers which were already sold to other sectors (e.g., milling offals and oilcake).

Table 12

PERCENTAGE DISTRIBUTION OF OUTPUT OF AGRICULTURE BY MAJOR COMMODITY GROUPS, 1934-38 AVERAGE AND 1946-61 AT CONSTANT 1948 PRICES PAID TO FARMERS*

I t e m	1934-38 average	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961
A. CROPS:															
Cereals and pulses	13.8	14.3	15.5	12.9	13.4	13.5	14.2	11.0	12.6	12.9	12.3	10.8	12.7	11.3	12.6
Potatoes and sugar beets	6.8	8.7	6.8	8.2	7.7	7.4	8.6	8.4	8.0	6.7	8.5	7.6	6.2	7.9	7.2
Oilseeds	0.4	0.8	0.8	0.6	0.9	0.7	0.8	0.8	0.9	1.0	0.7	0.8	1.1	1.1	1.3
Grapes, fruits & vegetables	9.2	15.9	12.5	12.1	10.2	8.4	15.1	12.5	10.9	10.7	9.0	13.4	8.6	13.3	9.8
Fibers, hops, tobacco & other	2.0	2.1	1.5	1.4	2.0	1.6	2.6	2.5	2.7	2.3	2.0	2.2	2.0	1.9	1.8
Total output of crops	32.1	41.8	37.0	35.2	34.2	31.5	41.4	35.2	35.2	33.5	32.5	34.7	30.6	35.6	32.7
Final output of crops	30.7	40.2	35.3	33.8	32.7	30.1	39.8	34.0	33.8	31.8	31.1	33.5	29.2	34.4	31.3
B. ANIMAL PRODUCTS:															
Meat	30.2	27.6	25.8	35.0	30.4	33.3	32.7	32.4	33.0	35.5	37.0	35.1	36.3	34.7	36.1
Eggs and milk	33.2	27.6	25.1	25.8	29.2	28.7	28.3	27.4	26.6	27.2	27.5	26.1	26.5	25.4	26.7
Wool, feather, honey & wax	0.5	0.5	0.5	0.6	0.6	0.5	0.7	0.7	0.6	0.6	0.6	0.6	0.9	0.6	0.6
Total output of animal products	63.9	55.7	51.4	61.3	60.2	62.5	61.7	60.4	60.2	63.2	65.1	61.8	63.8	60.7	63.7
C. TOTAL OUTPUT OF CROPS AND ANIMAL PRODUCTS:															
	94.5	95.9	86.7	95.1	92.9	92.6	101.5	94.5	94.0	95.3	96.2	95.4	93.0	95.1	95.0
D. LIVESTOCK CHANGES:															
	1.1	-0.3	9.3	0.6	2.9	3.2	-6.2	1.1	1.7	0.3	-0.7	0.3	2.8	0.5	0.6
E. MISCELLANEOUS OUTPUT:															
	1.9	1.9	1.7	1.9	1.9	1.9	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
F. FARM INVESTMENT IN KIND:															
	2.5	2.5	2.3	2.5	2.4	2.4	2.6	2.5	2.4	2.5	2.5	2.5	2.5	2.5	2.5
G. TOTAL OUTPUT OF AGRICULTURE:															
	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

*Source: Calculated from Table 10.

CHAPTER IV

CURRENT OPERATING EXPENSES AND DEPRECIATION

In the previous chapter we calculated the credit side of the agricultural sector, or the amount of goods and services which agriculture, as a production sector, makes available to the other sectors of the economy including the household sector. In this chapter we attempt to take account of the debit side of the agricultural sector, or the inputs into agriculture from other sectors in the form of goods and services necessary for agricultural production. We shall call this debit side the current operating expenses and depreciation of agriculture.

In what follows, we shall first, define "expenses;" second, discuss the methods used to calculate current operating expenses and depreciation in physical units, in constant values, and in index numbers; and third, summarize and evaluate the results.

A. Concept and Purpose

1. Definitions

Current operating expenses are defined here as total quantity of all goods and services bought by the agricultural sector from all non-agricultural sectors and used up in production of agricultural output. This concept is used by the United Nations in calculating the production expenses of agriculture in west European countries.¹ The items included in current operating expenses are: (1) expenditures on imports of feed, including feed manufactured from imported commodities; (2) handling charges on inter-farm sales which include merchants' margins and transportation provided by the non-agricultural sector; (3) fertilizers; (4) pesticides; (5) fuel and lubricants; (6) electricity; (7) maintenance and repairs of farm buildings, machinery, and equipment provided by the non-agricultural sectors; and (8) miscellaneous expenses.²

Depreciation, or the capital consumption allowance, is the year-to-year allocation to operating expenses of the cost of physical assets in agriculture

¹U.N., Economic Commission for Europe and FAO, Agricultural Accounts, op. cit., p. 10.

²For detailed coverage of items included in miscellaneous expenses see Appendix E, items 22-24.

over their economic life.³ It is the current charge to take account of wear and tear and obsolescence of capital goods in agriculture. The annual charge is based on the cost of replacing the assets at the end of the estimated economic lifetime of each asset. Depreciation and the current operating expenses as defined above are also called the production expenses of agriculture,⁴ or inputs into agriculture from other sectors. It is to be noted that depletion of natural resources, such as soil erosion, and non-insurable extraordinary capital losses, such as earthquakes, are not included in capital consumption allowances. Also, purchases of capital goods and repairs which alter the services of assets are not included in current operating expenses as defined in this study.⁵

2. Purpose

Calculation of current operating expenses is necessary so that they may be deducted from agricultural output to arrive at the gross product of agriculture. Deduction from this gross product of capital consumption allowances gives the net product, or value added of agriculture. Knowledge of the magnitude of production expenses is a useful indicator of the extent to which the agricultural sector is dependent on non-agricultural sectors for production requisites.

B. Calculation of Current Operating Expenses and Depreciation

Production expenses are calculated in 1936, 1948, and 1956 prices for the whole period under study. All prices used are the weighted average prices paid by farmers (producers) for production requisites from the non-agricultural sectors including the foreign sector.

In this section we discuss the methods used to estimate the major expense groups. Calculation, notes on sources, and explanations, however, are given in Appendix E for each item.

³U.N. Statistical Office, Concepts and Definitions of Capital Formation, Studies in Methods, Series F, No. 3, p. 15.

⁴U.S. Dept. of Agriculture, Major Statistical Series: Gross and Net Farm Income, Vol. 3, Washington, 1957, pp. 17-27. However, the production expenses in the United States include also the cost of hired labor (wages and social security of agricultural workers). We do not include the wages of agricultural workers in production expenses because the workers are considered part of the agricultural sector along with farm operators. The United States definition of expenses pertains to expenses incurred to farm operators rather than to the whole agricultural sector (see ibid., p. 3).

⁵U.N. Statistical Office, Concepts and Definitions, op. cit., Series F, No. 3, paragraph 57.

1. Imported Feed

In many countries, the value of imported feed, produced as by-products from imported raw materials, imported seed, and livestock imported for fattening and breeding are subtracted from agricultural output before all other expense items are computed and deducted from output. The measure derived in this way is the so-called "net" output.⁶ This concept seems to be useful for the study of potentialities of agriculture as determined by availabilities of domestic agricultural and non-agricultural resources. However, the ultimate purpose of this study is to derive the "net product," or value added of agriculture, and the measure of "net" output will be omitted here.⁷ Thus, the imports used for agricultural production are included along with all other operating expenses and, as such, are subtracted from output to derive the net product.

The net import of feed each year is charged as an expense for that year. The quantity of imported feed used may differ from the quantity imported in any year, but no adjustment for changes in carry-over can be made because of the non-availability of data. The differences, for any given year, however, are largely self-correcting over a longer period of years.

For Czechoslovakia the net imports of feed consist of milling offals derived from imported wheat and rye, oilcake including oilcake derived from imported oilseeds and other feed grain,⁸ concentrates, and fodder. The quantities are valued alternatively in 1936, 1948, and 1956 average prices paid by farmers which are given in Table 6, for milling offals and oilcake. The group of feed grain, concentrates, and fodder is valued at the same price as corn (Table 5, item 5) because the nutritive value per unit of corn is approximately the same as for the group of feed grain, concentrate, and fodder.⁹ No attempt has been made to estimate the value of net imports of seeds and of animals for fattening and breeding because they are insignificant.¹⁰

2. Handling Charges on Inter-Farm Sales

Official data are not available for inter-farm sales or for handling charges on these sales. Our own estimates were made on the basis of the value

⁶OEEC, The Measurement of Agricultural Production, op. cit., p. 15.

⁷See also Chapter III, A. 1.

⁸Barley, corn, millet, buckwheat, oats, bran, and fish meal."

⁹Thus, it is assumed here that one calorie in corn has the same price as in the group of feed grain, concentrates, and fodder. This may not be so in the short run, but in the long run the prices will not differ significantly.

¹⁰The actual value may not exceed much more than one million crowns per year (Stat. roc., 1958, p. 315). The data in this source include also the import of animals other than for breeding and fattening, i.e., animals for zoos.

of retail sales of feed and the cost of the wholesale and retail trade including profits per unit of retail sales during 1953-57. For the years prior to 1953 and after 1957 for which no data on retail trade are available, it was assumed that the share of handling charges in the total value of output of crops is the same as for the average of 1953-57. This assumption is justified by evidence of strong, positive correlation between quantity of output and expenditure on handling charges on inter-farm sales in countries where data are available (i.e., Austria, Belgium, and France).¹¹ Retail sales of feed include imported feed and results in an overestimate of inter-farm sales. However, the inter-farm sales of livestock and seed are omitted. The detailed calculation of the value of handling charges in 1936, 1948, and 1956 prices paid by farmers is given in Appendix E.

3. Fertilizers and Pesticides

The quantity of fertilizers utilized in terms of pure nitrogen, phosphoric oxide, and potassium oxide is known for the whole period. However, the data do not refer to each calendar year, but to the period from May 1 in a given year to April 30 in the following year.¹²

The total expenditure on fertilizers was obtained by valuing the quantity in terms of pure content of nitrogen, phosphoric oxide, or potassium oxide by 1936, 1948, and 1956 average prices paid by farmers per one unit of nitrogen, phosphoric oxide, or potassium oxide in nitrate of lime, basic slag, and potassium salts, respectively.

The data on the cost of pesticides are missing and were estimated at 15 per cent of the expenses on fertilizers. This was done on the basis of the ratio of annual expenditures on pesticides to fertilizers in Austria and the Federal Republic of Germany. Expenditures on pesticides amounted to 20 per cent of the expenditures on fertilizers in the former and to ten per cent in the latter.¹³ The Austrian consumption of fertilizers is 33 per cent lower and the German consumption about 188 per cent higher per unit of land than in Czechoslovakia.¹⁴ The higher the consumption of fertilizer is per unit of land the smaller the consumption of pesticides in relation to that of fertilizers.¹⁵ As the Czechoslovak consumption of fertilizers per unit of land

¹¹U.N. Economic Commission for Europe and Food and Agriculture Organization, Output, Expenses and Income of Agriculture in Some European Countries, Third Report, Geneva, 1958, pp. 36, 40, 49, 52, 83, and 86.

¹²Stat. roc., 1958, p. 237 and ibid., 1962, p. 534.

¹³U.N., ECE/FAO, Output, Expenses, op. cit., pp. 40 and 69.

¹⁴Statni nakladatelstvi politicke literatury, Postaveni CSR ve svetoven hospodarstvi, Prague, 1958, p. 71.

¹⁵U.N., ECE/FAO, Output, Expenses, op. cit., pp. 31ff.

lies between that of Austria and that of the Federal Republic of Germany, it is assumed that the percentage of pesticides consumption in Czechoslovakia is somewhere between the German and Austrian limit (between ten and 20 per cent). Lacking more precise information, we set an estimate for Czechoslovakia at the midpoint of those in the two countries, or 15 per cent of the expenses on fertilizers. Detailed calculation, sources, explanations concerning expenses on fertilizers and pesticides are given in Appendix E.

4. Fuel and Lubricants and Electricity

The value of fuel and lubricants consumed by tractors, trucks, and combustion engines serving agriculture is calculated on the basis of the value of fuel and lubricants consumed per "standard hectare of work"¹⁶ in machine-tractor stations, the number of "standard hectares of work" per tractor, and the number of tractors. Since data did not exist for the years prior to 1950, standard hectares of work per tractor figures for 1950 were used.

The expenses on fuel and lubricants per "standard hectare of work" in 1956 prices paid by machine-tractor stations are known.¹⁷ The expenses in 1936 and 1948 prices were derived from that in 1956 prices by assuming that relative changes in expenses on fuel and lubricants per "standard hectare of work" between 1936, 1948, and 1956 were the same as the changes in price indexes of petrol for the same years.

Expenditures on fuel for heating (lignite or firewood) were estimated on the basis of the number of feed cookers in 1947 and the value of fuel (lignite) consumed per cooker at 1936, 1948, and 1956 prices paid by farmers. The only significant amount of heating fuel was used for boiling feed for livestock. Fuel used for other purposes (i.e., heating poultry houses) is omitted. The number of cookers in 1947 is used for all years because of lack of data. While the number of cookers has probably increased since 1947, some of the new cookers use electricity. Thus, on balance, the number of cookers using fuel (lignite) for heating might not have changed much since 1947.

The cost of electricity used for production purposes in prewar agriculture was estimated on the basis of the total power of electromotors (in terms of K.W.H.), of estimated number of hours of effective work per electromotor, and of the 1936, 1948, and 1956 price per K.W.H. For postwar years it

¹⁶Standard hectare of work" equals the effort spent on medium plowing (7-9 inches deep) of one hectare of arable land (Zem. ekon., 1958, No. 5, p. 318).

¹⁷Fin. uver, 1958, No. 1, p. 43.

was assumed that the consumption of electricity changed in the same proportion as the number of tractors. This assumption is justified because there was a correlation for the three years, i.e., 1936, 1947, and 1953, the only years for which the number of electromotors is known.

Detailed calculation, notes on sources, and explanations for all of the above items are given in Appendix E.

5. Maintenance and Repairs and Depreciation

The charges for maintenance and repairs and the charges for depreciation are estimated on the basis of detailed calculation for the collective farms for 1956 when the charges for various items amounted to the following percentages of their replacement values: 4 per cent for maintenance and repairs of machinery and equipment and 8 per cent for depreciation; 0.72 per cent for maintenance and repairs of buildings and 1.6 per cent for their depreciation.¹⁸ The same rates are used for buildings for all years under study because the intensity of uses of buildings did not change significantly during this period. The rates of 4 per cent for maintenance and repairs and 8 per cent for depreciation of machinery and equipment are used for the 1951-61 period. For the 1934-38 average the rates of 7 per cent for depreciation and 3.5 per cent for maintenance and repairs of machinery and equipment are used. These rates are obtained from a study of a sample of farms in 1936-38 by the Institute of Agricultural Accounting and Management in Prague.¹⁹ For 1946-49 the respective rates used are 7.5 and 3.75 per cent obtained from a similar study of a sample of farms in 1946.²⁰ For 1950 the respective rates used are 7.75 and 3.88 per cent obtained by interpolation of the lower one for 1946-49 and the higher one for 1951-61. The year 1950 is a transition year; the increased number of machine-tractor stations permitted more intensive use of the existing stock of machinery and equipment.

Detailed calculation of the replacement value of buildings, machinery, and equipment and the value of maintenance and repairs and depreciation in 1936, 1948, and 1956 prices is given in Appendix E.

6. Miscellaneous Expenses

The expenses included under this item are: small tools and equipment not included elsewhere, racks, veterinary fees and supplies, office supplies, telephone, binder twine, baling wire, fencing wire, horseshoeing, cleaning

¹⁸ Zem. ekon., 1958, No. 7, pp. 467, 472, and 474. The maintenance and repairs in this source are calculated from the actual value of buildings, machinery, and equipment. We recomputed the percentages on the basis of replacement value.

¹⁹ Zpravy zem., 1946, No. 2-4, pp. 49 and 93.

²⁰ Ibid., 1949, No. 1, pp. 21 and 41.

materials, membership subscriptions to professional organizations, net cost of insurance on account of production, banking services and other expenses of the agricultural sector not accounted for elsewhere.

It is impossible to estimate the expenses for these individual items. The cost of the whole group is estimated at 21 per cent of all other current operating expenses combined (excluding depreciation) valued at 1936 and 1948 prices, and 22 per cent valued at 1956 prices paid by farmers. These percentages were obtained from studies of current operating expenses in sample farms in 1936-38, 1946, and 1954.²¹

Detailed calculation, sources, and explanations of all items of current operating expenses and depreciation are outlined in Appendix E and supporting tables.

C. Calculation of Indexes of Current Operating Expenses and Depreciation

Current operating expenses and depreciation weighted in 1936, 1948, and 1956 prices are given by main groups of expenses in Table 13. The magnitudes in that table, expressed in relatives of the base period 1934-38, give indexes of current operating expenses for the respective groups and the total. The indexes for individual series are given in Table 14 only in 1948 price weights to show their behavior over time.

The formula used for the calculation of these indexes is again the same as that used in calculation of the index of total crop and animal production given in Chapter II, C. 2.

D. Results and Evaluation

1. Results

The choice of price weights has a significant effect on measures of expense. In terms of 1936 price weights the indexes of total current operating expenses (Table 16) show the largest increase, from 100 in 1934-38 to 358 in 1958-61, in terms of 1948 price weights the increase is from 100 to 343, and in terms of 1956 price weights the increase is from 100 to 311.

The greater growth of the expense indexes calculated in 1936 price weights is due to the relatively high price weights than in 1948 and 1956 of those items whose utilization for production increased faster (fuel and electricity) and the relatively lower price weights of those items whose utilization expanded at a slower pace (maintenance and repairs)

²¹Ibid., 1946, No. 2-4, pp. 92 and 93, used for the share at 1936 prices; ibid., 1949, No. 1, pp. 40 and 41, used for the share at 1948 prices; and Svoboda, 1957, pp. 234 and 252, used for the share at 1956 prices.

Table 13

CURRENT OPERATING EXPENSES AND DEPRECIATION IN AGRICULTURE,

1934-38 AVERAGE AND 1946-1961

AT CONSTANT 1936, 1948 AND 1956 PRICES PAID TO FARMERS*

(Million crowns)

(1) <u>I t e m</u>			(2) Average 1934-38	(3) 1946	(4) 1947	(5) 1948	(6) 1949	(7) 1950
1.	Imported feed:	at 1936 prices	290	51	158	761	696	723
2.	"	at 1948 prices	687	96	360	1,856	1,717	1,749
3.	"	at 1956 prices	234	36	126	600	546	565
4.	Handling charges on inter-farm sales:	at 1936 prices	198	177	124	182	189	190
5.	"	at 1948 prices	524	485	339	496	503	522
6.	"	at 1956 prices	142	133	93	135	136	140
7.	Fertilizers:	at 1936 prices	381	483	531	590	668	888
8.	"	at 1948 prices	889	1,127	1,244	1,358	1,532	2,033
9.	"	at 1956 prices	194	237	269	291	323	427
10.	Pesticides:	at 1936 prices	57	72	80	88	100	133
11.	"	at 1948 prices	133	169	187	204	230	305
12.	"	at 1956 prices	29	36	40	44	48	64
13.	Fuel and lubricants:	at 1936 prices	56	82	99	124	146	150
14.	"	at 1948 prices	211	326	406	519	614	633
15.	"	at 1956 prices	51	78	97	123	146	150
16.	Electricity:	at 1936 prices	70	145	197	270	332	344
17.	"	at 1948 prices	105	217	295	405	498	516
18.	"	at 1956 prices	21	43	59	81	100	103
19.	Maintenance, repairs:	at 1936 prices	971	1,021	1,030	1,036	1,050	1,097
20.	"	at 1948 prices	3,165	3,410	3,443	3,472	3,516	3,669
21.	"	at 1956 prices	861	884	890	899	912	951
22.	Miscellaneous expense:	at 1936 prices	425	427	466	641	668	740
23.	"	at 1948 prices	1,200	1,224	1,318	1,745	1,808	1,980
24.	"	at 1956 prices	337	318	346	478	486	528
25.	Total current operating expenses:	at 1936 prices	2,448	2,458	2,685	3,692	3,849	4,265
26.	"	at 1948 prices	6,914	7,054	7,592	10,055	10,418	11,407
27.	"	at 1956 prices	1,869	1,765	1,920	2,651	2,697	2,928
28.	Depreciation:	at 1936 prices	2,048	2,132	2,152	2,165	2,194	2,288
29.	"	at 1948 prices	6,675	7,118	7,189	7,252	7,345	7,650
30.	"	at 1956 prices	1,816	1,846	1,858	1,877	1,903	1,981
31.	Total current operating expenses & depreciation:	at 1936 prices	4,496	4,590	4,837	5,857	6,043	6,553
32.	"	at 1948 prices	13,589	14,172	14,781	17,307	17,763	19,057
33.	"	at 1956 prices	3,685	3,611	3,778	4,528	4,600	4,909

*Sources and methods of calculation are given in Appendix E.

	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
	<u>1951</u>	<u>1952</u>	<u>1953</u>	<u>1954</u>	<u>1955</u>	<u>1956</u>	<u>1957</u>	<u>1958</u>	<u>1959</u>	<u>1960</u>	<u>1961</u>
•	909	788	801	774	1,184	1,263	1,196	779	1,253	1,524	1,020
2.	2,078	1,840	1,850	1,744	2,842	3,136	2,887	1,753	3,007	3,778	2,368
3.	700	613	627	594	926	989	928	598	970	1,190	791
4.	179	171	282	124	176	189	177	200	276	195	195
5.	485	454	778	343	484	520	486	550	760	536	536
6.	133	123	224	99	139	150	140	158	219	154	154
7.	849	872	1,020	1,284	1,473	1,557	1,598	2,057	2,065	2,151	2,274
8.	1,946	2,024	2,364	2,959	3,358	3,593	3,705	4,725	4,727	4,902	5,225
9.	409	426	498	619	699	755	776	983	989	1,025	1,100
10.	127	131	153	193	221	234	240	309	310	323	341
11.	292	304	355	444	504	539	556	709	709	735	784
12.	61	64	75	93	105	113	116	147	148	154	165
13.	233	247	342	374	411	486	570	609	858	1,081	1,317
14.	1,008	1,072	1,499	1,644	1,810	2,145	2,525	2,699	3,821	4,823	5,888
15.	239	254	355	389	429	508	598	639	904	1,141	1,393
16.	380	400	433	470	513	585	659	761	912	1,158	1,419
17.	570	601	649	706	770	878	988	1,141	1,368	1,737	2,128
18.	114	120	130	141	154	176	198	228	274	347	426
19.	1,144	1,174	1,141	1,183	1,229	1,283	1,316	1,296	1,338	1,419	1,554
20.	3,828	3,945	3,835	3,980	4,133	4,322	4,437	4,384	4,538	4,819	5,286
21.	990	1,019	984	1,018	1,063	1,111	1,137	1,109	1,137	1,193	1,301
22.	802	794	876	924	1,093	1,175	1,209	1,262	1,473	1,649	1,705
23.	2,143	2,150	2,379	2,482	2,919	3,178	3,273	3,352	3,975	4,479	4,665
24.	582	576	636	650	773	836	856	850	1,021	1,145	1,173
25.	4,623	4,577	5,048	5,326	6,300	6,772	6,965	7,273	6,485	9,500	9,825
26.	12,350	12,390	13,709	14,302	16,820	18,311	18,857	19,313	22,905	25,809	26,880
27.	3,228	3,195	3,529	3,603	4,288	4,638	4,749	4,712	5,662	6,349	6,503
28.	2,384	2,446	2,381	2,466	2,560	2,669	2,738	2,695	2,788	2,924	3,234
29.	7,978	8,218	8,002	8,298	8,608	8,992	9,232	9,129	9,451	9,926	10,992
30.	2,064	2,123	2,054	2,133	2,214	2,312	2,366	2,311	2,370	2,460	2,710
31.	7,007	7,023	7,429	7,792	8,860	9,441	9,703	9,968	11,273	12,424	13,059
32.	20,328	20,608	21,711	22,600	25,428	27,303	28,089	28,442	32,356	35,735	37,872
33.	5,292	5,318	5,583	5,725	6,502	6,950	7,115	7,023	8,032	8,809	9,213

from the prewar years to 1958-61. The 1956 price weights for fuel, lubricants, and electricity decreased relatively more than the 1948 price weights for these two items in relation to 1936 relative price weights.

The choice of price weights has less effect on indexes of depreciation than on the indexes of current operating expenses. The indexes of depreciation, calculated in 1948 price weights, increased by 48 per cent; in terms of 1936 and 1956 price weights they increased by 42 per cent, and by 36 per cent, respectively. The differences are due to relative shifts in prices.

The indexes of current operating expenses including depreciation show differences smaller than those of current operating expenses and higher than those of depreciation. This is the result of opposite forces in these two indexes which are partly netted out.

There are great differences in the growth of individual expense items. Table 14 indicates that the consumption of fuel and lubricants increased 20 times, electricity 15 times, fertilizer 5.5 times, imported feed 4 times, maintenance and repairs 50 per cent between 1934-38 and 1958-61 average. These differences in the behavior of individual items result in changes in the percentage distribution of individual expense items in total production expenses over time. Thus, between 1934-38 and 1958-61 the share of fuel and lubricants increased from 1.6 to 12.6 per cent, that of electricity from 0.8 to 4.7 per cent, and that of fertilizers from 6.5 to 14.7 per cent of the total production expenses including depreciation. While the expenses for maintenance and repairs increased 50 per cent between 1934-38 and 1958-61, their relative share in total expenses declined from 23.3 to 14.2 per cent for the same period in terms of 1948 price weights. Depreciation in 1948 price weights increased by 48 per cent, but its share decreased by one-third from 49.1 to 29.5 per cent of the total production expenses between 1934-38 and 1958-61.²² It is to be noted that the largest expense item is depreciation followed by maintenance and repairs. The indexes and shares of individual items in 1936 and 1956 price weights were not calculated as they are approximately the same as in 1948 prices. This relationship is indicated by the absolute figures calculated in 1936, 1948, and 1956 price weights for individual expense items in Table 13.

2. Evaluation

As the published Czechoslovak statistics do not include data on current operating expenses, our results cannot be checked against official data. For the prewar period Milos Stadnik²³ estimated current operating expenses including depreciation at 4,442 million current crowns for 1936-37 (July 1, 1936-June 30, 1937) which is surprisingly close to our figure of 4,496 million crowns at 1936 prices paid by farmers for 1934-38 average. Stadnik's figures,

²²This is due to a large increase in expenses on imported feed, fertilizers, pesticides, fuel and lubricants, and electricity (see Table 14).

²³Milos Stadnik, Narodni duchod a jeho rozdeleni, Prague, 1946, p. 91.

however, do not have the same coverage as ours. He omitted handling charges on inter-farm sales which we included, and he included agricultural tax which we omitted because this tax is similar in nature to an income tax. In Czechoslovakia the agricultural tax, or land tax, is merely an administrative device for the collection of a direct income tax.²⁴ The depreciation charges in Stadnik's figures are considerably lower than ours because his charges were based on bookkeeping values of fixed capital rather than on actual cost of replacement of fixed capital. Our charges were based on actual replacement cost of buildings, machinery and equipment. Straight-line rates were used for depreciation charges in our study. Stadnik's figures include also new investments in buildings, machinery, and equipment which do not belong in current operating expenses as defined in this study.²⁵

Thus, although Stadnik's figures on "current operating expenses" happen to be very close to ours, their content is different from our figures and the similarity is largely a coincidence.

The charges for capital consumption allowances, amounting to 49 and 29.5 per cent of the total current operating expenses including depreciation in 1934-38 and 1958-61, respectively, seem to be high, but actually they are not. The depreciation charges used in many countries and also in Czechoslovakia (until 1955) are based mostly on the original costs of assets, or bookkeeping values; the rates applied are usually out of date. The more intensive use of machinery and equipment in recent years shortens their economic life by increasing wear and tear, and the changing prices since the war years result in large differences between the original cost and the replacement cost of assets at the end of their economic life.²⁶

The depreciation charges calculated in this study are based on replacement cost, and the rates used are those corresponding to estimated economic life of assets based on the latest studies in Czechoslovakia²⁷ and in other countries.²⁸ They correspond to actual value of wear and tear of physical assets more accurately than the charges conventionally used in national accounts of many countries.

Having obtained agricultural output, current operating expenses and depreciation, we have all necessary elements for the calculation of gross and net product of agriculture. This is done in the next chapter.

²⁴See also U.N. ECE/FAO, Agricultural Accounts, op. cit., p. 20.

²⁵Ibid., p. 38.

²⁶For example, for the Czechoslovak State farms, the value of buildings at original cost amounted to 2,772 crowns in 1955, but the value at replacement cost amounted to 6,914 crowns of the same assets in 1955. Up to 1955 the depreciation charges were based on the original cost of assets. From 1956 the depreciation charges are based on replacement cost of assets in official Czechoslovak data (Zem. ekon., 1958, No. 4, p. 227).

²⁷Zem. ekon., 1958, No. 7, pp. 465-81.

²⁸U.S. Dept. of Agriculture, Major Statistical Series: Gross and Net Farm Income, Vol. 3, op. cit., pp. 17-18.

Table 14-15

INDEX NUMBERS AND PERCENTAGE DISTRIBUTION OF EXPENSES, OUTPUT, GROSS AND NET PRODUCT AT 1948 PRICES, 1934-38 AND 1946-1961*

I t e m	1934-38 average	1946	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961
I. EXPENSES:																	
A. INDEX NUMBERS;																	
Imported feed	100.0	14.0	52.4	270.2	249.9	254.6	302.5	267.8	269.3	253.9	413.7	456.5	420.2	255.2	437.7	549.9	344.7
Handling charges	100.0	92.6	64.7	94.7	96.0	99.6	92.6	86.6	148.5	65.5	92.4	99.2	92.7	105.0	145.0	102.3	102.3
Fertilizers	100.0	126.8	139.9	152.8	172.3	228.7	218.9	227.7	266.0	332.8	377.7	404.2	416.8	531.5	531.8	551.5	587.8
Pesticides	100.0	127.1	140.6	153.4	172.9	229.3	219.5	228.6	266.9	333.8	378.9	405.3	418.1	533.1	533.1	552.6	589.5
Fuel and lubricants	100.0	154.5	192.4	246.0	291.0	300.0	477.7	508.1	710.4	779.1	857.8	1,016.6	1,196.7	1,279.1	1,810.9	2,285.8	2,790.5
Electricity	100.0	206.7	281.0	385.7	474.3	491.4	542.9	572.4	618.1	672.4	733.3	836.2	941.0	1,086.7	1,302.9	1,654.3	2,026.7
Maintenance & repairs	100.0	107.7	108.8	109.7	111.1	115.9	120.9	124.6	121.2	125.8	130.6	136.6	140.2	138.5	143.4	152.3	167.0
Miscellaneous expenses	100.0	102.0	109.8	145.4	150.7	165.0	178.6	179.2	198.2	206.8	243.2	264.8	272.8	279.3	331.2	373.2	388.8
B. PERCENTAGE DISTRIBUTION:																	
Expenses & depreciation	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Depreciation	49.1	50.2	48.6	41.9	41.3	40.1	39.2	39.9	36.9	36.7	33.9	32.9	32.9	32.1	29.2	27.8	29.0
Total expenses	50.9	49.8	51.4	58.1	58.6	59.9	60.8	60.1	63.1	63.3	66.1	67.1	67.1	67.9	70.8	72.2	71.0
Miscellaneous expenses	8.8	8.6	8.9	10.1	10.2	10.4	10.5	10.4	11.0	11.0	11.5	11.6	11.7	11.8	12.3	12.5	12.3
Maintenance & repairs	23.3	24.1	23.3	20.1	19.8	19.3	18.8	19.1	17.7	17.6	16.3	15.8	15.8	15.4	14.0	13.5	14.0
Electricity	0.8	1.5	2.0	2.3	2.8	2.7	2.8	2.9	3.0	3.1	3.0	3.2	3.5	4.0	4.2	4.9	5.6
Fuel and lubricants	1.6	2.3	2.7	3.0	3.5	3.3	5.0	5.2	6.9	7.3	7.1	7.9	9.0	9.5	11.8	13.5	15.5
Pesticides	1.0	1.2	1.3	1.2	1.3	1.6	1.4	1.5	1.6	2.0	2.0	2.0	2.0	2.5	2.2	2.1	2.1
Fertilizers	6.5	8.0	8.4	7.8	8.6	10.7	9.6	9.8	10.9	13.1	13.2	13.2	13.2	16.6	14.6	13.7	13.8
Handling charges	3.9	3.4	2.3	2.9	2.8	2.7	2.4	2.2	3.6	1.5	1.9	1.9	1.7	1.9	2.3	1.5	1.4
Imported feed	5.1	0.7	2.4	10.7	9.7	9.2	10.2	8.9	8.5	7.7	11.2	11.5	10.3	6.2	9.3	10.6	6.3
II. DISTRIBUTION OF OUTPUT, EXPENSES, GROSS & NET PRODUCT:																	
Output	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
less Expenses	8.1	11.6	14.9	15.9	14.6	14.6	16.5	16.4	18.8	19.5	20.9	21.9	22.4	21.6	26.0	27.5	29.2
Gross Product	91.9	88.4	85.1	84.1	85.4	85.4	83.5	83.6	81.2	80.5	79.1	78.1	77.6	78.4	74.0	72.5	70.8
less Depreciation	7.8	11.7	14.2	11.5	10.3	9.9	10.7	10.9	11.0	11.3	10.7	10.7	10.9	10.2	10.7	10.6	11.9
Net Product	84.2	76.8	70.9	72.7	75.2	75.5	72.8	72.8	70.2	69.2	68.4	67.4	66.7	68.1	63.2	62.0	58.9
III. GROSS PRODUCT (Million Crowns):																	
At 1936 prices	18062	12624	9423	11972	13623	14254	13167	13335	12675	12020	12769	13046	12773	13587	11875	12545	11719
At 1948 prices	78937	53957	43203	53271	61052	66642	62335	63308	59076	59201	63758	65488	65509	69944	65114	68165	65210
At 1956 prices	21925	15372	12261	15025	17149	18531	17533	17692	16645	16830	18089	18508	18495	19984	18415	19617	18925
IV. NET PRODUCT (Million Crowns):																	
At 1936 prices	16014	10492	7271	9807	11429	11966	10783	10889	10294	9554	10209	10377	10035	10892	9087	9621	8485
At 1948 prices	72262	46839	36014	46019	53707	58992	54357	55090	51074	50903	55150	56496	56277	60815	55663	58239	54218
At 1956 prices	20109	13526	10403	13148	15246	16550	15469	15569	14591	14697	15875	16196	16129	17673	16045	17157	16215

*Sources: Figures in this table are calculated from data in Tables 10 and 13.

CHAPTER V

GROSS AND NET PRODUCT

A. Gross Product of Agriculture

The gross product of agriculture is the gross value added by productive activity within the agricultural sector to the value of materials and services which are obtained from non-agricultural sectors including foreign sector.¹ "Gross" means that in estimating the product no allowance has been made for consumption (depreciation and obsolescence) of buildings, machinery, and equipment due to wear and tear in the production process. The contribution of the agricultural sector to gross national product² consists of the output of goods and services produced by the agricultural sector minus the amount of goods and services purchased from other sectors and used in current production. Deduction of the cost of purchases from other sectors is necessary to avoid double-counting.

Two concepts of gross agricultural product exist: gross product at market prices and gross product at factor cost. In the former concept, the amount of goods and services produced is valued at prices determined by supply and demand conditions plus indirect taxes and minus subsidies. The latter concept differs from the former in that indirect taxes are deducted and subsidies are added. Thus, the gross product of agriculture at factor cost equals the returns to factors of production in agriculture (labor, land, and capital) before capital consumption allowances are deducted.³

In this study the gross product of agriculture is calculated in 1936, 1948, and 1956 average prices received by farmers for the sales of agricultural products. It is obtained from output by subtracting current

¹U.N. ECE/FAO, Agricultural Accounts, op. cit., p. 7.

²Gross national product represents the market value of the gross output of the nation, including all government services, valued at cost (see Richard Ruggles and Nancy D. Ruggles, National Income Accounts and Income Analysis, New York, McGraw-Hill Publishing Co., Inc., 1956, pp. 108 and 110).

³The concept of "factor cost" does not mean the costs necessary to obtain the services of the factors. It is an adjustment of market value of the product to show the portion thereof that the factors receive. "Factor return" instead of "factor cost" would be a more accurate term. (See Ruggles, National Income Accounts, op. cit., pp. 116-17.)

operating expenses (see Tables 10 and 13). The gross product is directly affected by prices paid by farmers for the purchases of production requisites. The question is: What is the nature of these prices? Are they market prices or factor cost prices? Unfortunately, they are a mixture of both; they contain an element of indirect taxes and an element of subsidies. The bulk of indirect taxes, consisting of sales taxes and excise taxes, is included in the price of purchased production requisites. The remainder, consisting of certain local rates and fees, is insignificant and is not taken into account because of lack of data. Thus, the indirect taxes are already subtracted from gross agricultural product through their inclusion in the prices of current operating expenses for all three periods--1936, 1948, and 1956.

The subsidies received by Czechoslovak agriculture are of three kinds. One is from price supports. These supports to prices were first applied in 1936 when the prices of major grains were set above market prices by the grain monopoly (Chapter I). In 1948 the government subsidized to some extent the prices of fiber and oil crops.⁴ The second kind of subsidy, received by collectives and state farms, is in the form of controlled prices for production requisites. The 1956 prices of fertilizers, fuel, feed, and building materials, for instance, were lower than the retail prices.⁵ The third type of subsidy consists of direct grants to machine-tractor stations and state farms to cover their operating losses. This type of subsidy affects largely the magnitude of gross-product calculated in 1956 prices. Thus, the gross product valued at 1936 prices received by farmers is, in fact, the gross product at factor cost, because the subsidies are included and the indirect taxes are excluded from the prices which are used for valuation of gross product. This is not true of the gross product valued at 1948 and 1956 prices received by farmers, which does not include all subsidies. Subsidies to state farms amounted to 1,199 million crowns in 1948.⁶ Subsidies to state farms, collectives, and machine-tractor stations amounted to 2,260 million crowns in 1956.⁷ Both of these amounts (valued at current prices) are not included in the gross product valued at 1948 and 1956 prices.

It would be possible to make an adjustment for these subsidies. The 1948 subsidies could be added to the 1948 gross product (valued at 1948 prices) and the sum could be extrapolated for the whole 1934-38 and 1946-61 period by the volume of gross product (valued at 1948 prices). Similarly, the 1956 subsidies could be added to the 1956 gross product (valued at 1956 prices) and the sum could be extrapolated for the whole 1934-38 and 1946-61 period by the volume of gross product (valued at 1956 prices). This procedure, however, would have no effect on measures of change in gross product over time and, therefore, was not used. But it must be remembered that the real gross

⁴Plan. hosp., 1954, No. 3, p. 190.

⁵Politicka ekonomie, 1958, No. 2, pp. 106-07.

⁶Stat. zav. ucet, 1948, p. 23.

⁷Project on National Income in East Central Europe, National Income and Product of Czechoslovakia, 1955-56, Ms., p. 190.

product valued at 1948 and 1956 prices was higher than that valued at market prices and was lower than that valued at factor cost by the amount of direct subsidy.

The gross product in crowns valued at 1936, 1948, and 1956 prices, given in Table 15, was obtained by subtracting from the total agricultural output (Table 10) the current operating expenses (Table 13). The corresponding index numbers of gross product valued at 1938, 1948 and 1956 prices are given in Table 16, items 10-12. From 1934-38 to 1958-61 the gross product valued at 1936 prices decreased by 31 per cent, valued at 1948 prices it decreased by 15 per cent, and valued at 1956 prices it decreased by 12 per cent. The choice of price weights evidently affects the results significantly. The gross product valued at 1936 prices declined almost twice as much as that valued either at 1948 or 1956 prices.

The reason for this great difference is to be found in the behavior of both the output and the current operating expenses series. Output valued at 1936 prices is lower than that valued at 1956 prices and current operating expenses valued at 1936 prices are substantially higher than those valued either at 1948 or 1956 prices. The reasons for differences in output and current operating expenses calculated in different price weights already have been discussed (Chapter III, C.1. and Chapter IV, D.1., respectively).

B. Net Product of Agriculture

The net product of agriculture is the gross product as defined above⁸ minus an allowance for using up fixed capital in the process of production.

The net product (Table 15) obtained by subtracting from the gross product the capital consumption allowances (Table 13) was calculated in 1936, 1948, and 1956 prices received by farmers for the sales of their products and prices paid by farmers for production requisites. As in the case of gross product, the net product valued in 1936 prices is at factor cost, and the net product valued in 1948 and 1956 prices includes none of the direct subsidies (outright grants to state farms, collectives, and machine-tractor stations) discussed in the previous section.

The corresponding index numbers of net product valued at 1936, 1948, and 1956 prices (Table 16, items 16-18) indicate that the net product declined more than the gross product between 1934-38 and 1958-61. Valued at 1936 prices the net product decreased by 41 per cent, valued at 1948 prices it decreased by 21 per cent, and valued at 1956 prices it decreased by 17 per cent.

The greater decline of net product than of gross product is attributable to sharply increasing allowances for capital consumption between 1934-38 and 1958-61.

⁸U.N., ECE/FAO, Agricultural Accounts, op. cit., p. 8.

Table 16

INDEX NUMBERS OF PRODUCTION, OUTPUT, EXPENSES, GROSS AND NET PRODUCT OF AGRICULTURE, 1934-38 AVERAGE AND 1946-61, AT CONSTANT 1936, 1948 AND 1956 PRICES PAID TO OR BY FARMERS*

I t e m	1934-38 average	1946	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961
A. Our Calculations:																	
Total crop & animal pro- duction: at 1936 prices	100.0	76.1	57.7	77.9	86.2	86.9	88.9	85.7	89.6	84.9	85.5	99.0	95.6	97.1	96.3	101.1	99.3
at 1948 "	100.0	74.1	57.6	76.1	85.0	87.8	89.0	86.5	88.1	85.8	96.1	99.1	97.1	99.8	98.3	103.6	101.7
at 1956 "	100.0	74.6	58.2	76.6	85.5	87.5	89.4	86.5	88.2	86.0	96.5	99.2	96.9	99.5	98.5	103.9	102.0
Agricultural output:																	
at 1936 prices	100.0	73.5	59.0	76.4	85.2	90.3	86.7	87.3	86.4	84.6	93.0	96.6	96.2	101.7	99.3	107.5	105.0
at 1948 "	100.0	71.1	59.2	73.8	83.2	90.9	87.0	88.2	84.8	85.6	93.9	97.6	98.3	104.0	102.5	109.5	107.3
at 1956 "	100.0	72.0	59.6	74.3	83.4	90.2	87.3	87.8	84.8	85.9	94.0	97.3	97.7	103.8	101.2	109.1	106.9
Current operating expenses: at 1936 prices	100.0	100.4	109.7	150.8	157.2	174.2	188.8	187.0	206.2	217.6	257.4	276.6	284.5	297.1	346.6	388.1	401.4
at 1948 "	100.0	102.0	109.8	145.4	150.7	165.0	178.6	179.2	198.3	206.9	243.3	264.8	272.7	279.3	331.3	373.3	388.8
at 1956 "	100.0	94.4	102.7	141.8	144.3	156.7	172.7	170.9	188.8	192.8	229.4	248.2	254.1	252.1	304.5	339.7	347.9
Gross product (at factor cost): at 1936 prices	100.0	69.9	52.2	66.3	75.4	78.9	72.9	73.8	70.2	66.5	70.7	72.2	70.7	75.2	65.7	69.5	64.9
at 1948 "	100.0	68.4	54.7	67.5	77.3	84.4	79.0	80.2	74.8	75.0	80.8	83.0	83.0	88.6	82.5	86.4	82.6
at 1956 "	100.0	70.1	55.9	68.5	78.2	84.5	80.0	80.7	75.9	76.8	82.5	84.4	84.4	91.1	84.0	89.5	86.3
Capital consumption allowances at 1936 prices	100.0	104.1	105.1	105.7	107.1	111.7	116.4	119.4	116.3	120.4	125.0	130.3	133.7	131.6	136.1	142.8	157.9
at 1948 "	100.0	106.6	107.7	108.6	110.0	114.6	119.5	123.1	119.9	124.3	129.0	134.7	138.3	136.8	141.6	148.7	164.7
at 1956 "	100.0	101.7	102.3	103.4	104.8	109.1	113.7	116.9	113.1	116.9	121.9	127.3	130.3	127.3	130.5	135.5	149.2
Net product (at factor cost): at 1936 prices	100.0	65.5	45.4	61.2	71.4	74.7	67.3	68.0	64.3	59.7	63.8	64.8	62.7	68.0	56.7	60.1	53.0
at 1948 "	100.0	64.8	49.8	63.7	74.3	81.6	75.2	76.2	70.7	70.4	76.3	78.2	77.9	84.2	77.0	80.6	75.0
at 1956 "	100.0	67.3	51.7	65.4	75.8	82.3	76.9	77.4	72.6	73.1	78.9	80.5	80.2	87.9	79.8	85.3	80.6
(1948=100)	152.9	102.9	79.1	100.0	116.0	125.9	117.7	118.4	111.0	111.8	120.7	123.2	122.7	134.4	122.0	130.5	114.9
B. Official Data:^a Crop & animal production "National income" (Net product)																	
	100.0	-	-	74.8	83.5	87.3	88.3	84.5	84.9	83.7	93.5	96.3	96.0	98.5	97.8	103.1	103.1
	-	-	-	100.0	122.9	135.2	125.2	120.2	127.6	113.6	126.3	122.3	131.3	128.2	109.2	118.0	114.9

^aValued at 1955 prices and 1960 prices, see Stat. rec., 1958, pp. 29-30 and ibid., 1962, pp. 42-43.

*Sources: Data were taken from Tables 7, 11, 13 and 14-15.

Net product is affected more than all previous measures by the choice of different price weights. Index of net product valued at 1936 prices is 29 per cent lower than that valued at 1956 and the index of net product valued at 1948 prices 5 per cent lower. The reasons for the differences are the same as those discussed in connection with gross product, i.e., the greater increase in current operating expenses valued at 1936 prices than that valued at 1948 or 1956 prices. In addition, the differences are magnified by the differences in increase of capital consumption allowances. There is no way of telling which of these three price weights is the most appropriate to use in valuation of the net product. All measures derived in this study are inter-dependent. However, they all ultimately depend on amounts of factors of production (land, capital, and labor) used and the effectiveness of their use or productivity. The next two chapters are devoted to measurement of productivity of land, capital, and labor.

CHAPTER VI

PRODUCTIVITY OF LAND AND CAPITAL

Measures of productivity in agriculture are usually derived from the relationship between volume of output and volume of input of one or more of the factors of production. Conventional productivity measures use mostly labor input, land input, or capital input as the denominator of the productivity ratio. They may use the volume of total output, gross product, or net product as the numerator of the productivity ratio. The next chapter will be concerned with the product per unit of labor. In this chapter we calculate the product per unit of land, livestock, and capital including land.

A. Production Per Unit of Land

We calculate in this section first, the total crop production per unit of land, and second, the production of individual series per hectare or yields of individual crops per unit of land.

1. Crop Production Per Hectare
of Agricultural Land

The crop production per hectare measures the volume of¹ crops produced in any given period (year) per hectare of agricultural land. The magnitude of this measure, however, is affected by all factors (land, labor, and capital) that contribute to the average output per unit of land.

Crop production per hectare is obtained here by dividing the total crop production at 1936, 1948, and 1956 prices (Table 7, items 1-3, respectively) by the total number of hectares of agricultural land for each year or period (Table 1, item 1).

This crop production per hectare of agricultural land in index numbers (by the same method as in Chapter II) is given in Table 17-18. The results indicate that crop production per hectare of agricultural land remained for most of the postwar period below the prewar level. The pattern of the behavior of these indexes is very close to the behavior pattern of the indexes of total crop production (Table 7, items 4-6). Only during very good crop

¹U.S. Dept. of Agriculture, Agricultural Production and Efficiency, Vol. 2, op. cit., p. 51.

Table 17-18

CROP PRODUCTION PER HECTARE OF AGRICULTURAL LAND, YIELDS PER HECTARS AND HEAD OF LIVESTOCK;
OUTPUT, GROSS PRODUCT AND NET PRODUCT PER UNIT OF ALL CAPITAL AT 1936 PRICES*
1934-38=100

<u>I t e m</u>		<u>1934-38</u>	<u>1946</u>	<u>1947</u>	<u>1948</u>	<u>1949</u>	<u>1950</u>	<u>1951</u>	<u>1952</u>	<u>1953</u>	<u>1954</u>	<u>1955</u>	<u>1956</u>	<u>1957</u>	<u>1958</u>	<u>1959</u>	<u>1960</u>	<u>1961</u>
<u>average</u>																		
A. PER HECTARE:																		
WHOLE COUNTRY:																		
1. Crop production	100	84.8	59.0	86.5	92.5	89.8	93.7	86.4	102.2	92.9	105.5	106.4	100.4	102.4	98.5	106.4	102.3	102.3
2. Wheat	100	86.0	59.6	95.9	114.0	110.5	116.4	119.9	121.6	91.1	119.3	124.6	120.5	107.0	133.9	136.3	152.0	152.0
3. Barley	100	82.4	69.3	90.6	105.3	98.8	105.9	107.1	112.9	104.1	118.2	124.1	120.0	105.3	128.8	145.9	134.1	134.1
4. Sugar beets	100	86.8	46.1	82.5	77.1	99.6	74.7	71.9	84.4	91.4	99.8	72.3	104.4	104.7	71.9	121.2	98.1	98.1
5. Potatoes	100	106.1	57.9	75.0	75.3	91.6	82.0	87.8	113.2	97.8	94.4	113.4	103.4	80.9	80.6	66.8	77.2	77.2
SLOVAKIA:																		
6. Wheat	100	85.1	45.3	92.0	118.9	118.2	125.7	122.3	140.5	102.0	123.6	125.7	131.1	106.8	142.6	122.3	143.9	143.9
7. Barley	100	90.7	69.3	93.6	111.4	98.6	117.1	115.0	133.6	117.1	128.6	136.4	139.3	112.9	142.1	159.3	142.1	142.1
8. Sugar beets	100	59.1	34.3	81.0	78.8	89.6	81.4	59.4	86.0	92.5	99.2	80.7	114.4	117.8	108.4	127.3	100.1	100.1
9. Potatoes	100	91.1	64.7	88.7	91.9	81.4	90.1	85.1	128.0	108.9	113.4	125.4	119.7	104.4	84.5	78.8	96.8	96.8
B. YIELDS PER HEAD:																		
10. Meat per pig	100	60.3	58.9	69.6	72.1	83.4	70.0	71.0	51.9	70.7	72.1	74.7	76.1	76.5	79.9	73.7	73.3	73.3
11. Milk per cow	100	71.0	67.4	66.6	75.3	79.1	81.7	79.4	70.8	74.1	80.7	85.6	86.8	87.8	87.9	90.2	93.4	93.4
12. Eggs per hen	100	79.8	81.6	89.3	89.1	93.4	96.3	89.6	93.4	78.5	76.3	62.9	84.0	83.7	83.6	84.2	86.0	86.0
C. PER UNIT OF ALL CAPITAL:																		
13. Output	100	77.8	63.2	80.8	88.9	93.5	89.1	89.2	88.6	88.0	95.4	97.1	96.1	101.3	97.1	103.5	99.1	99.1
14. Gross product	100	74.0	55.9	70.1	78.7	81.7	74.9	75.4	72.0	69.2	72.5	72.6	70.6	74.9	64.2	66.9	61.2	61.2
15. Net product	100	69.3	48.6	64.7	74.5	77.3	69.2	69.5	65.9	62.1	65.4	65.1	62.6	67.7	55.4	57.8	50.0	50.0

*Sources and explanatory notes: See Appendix F, Notes to Tables 17, 18 and 19.

years (i.e., 1953-, 1955,- 1958 and 1960) was the prewar level surpassed. By 1961, the crop production per hectare was just a little above the prewar level. The effect of price weights on indexes of crop production per unit of land is not large. The index calculated in 1936 price weights is 2-3 percentage points lower than the index calculated in 1948 or 1956 price weights. The reasons for the differences in indexes calculated in different price weights have been discussed already in Chapter II, D.1.

2. Yields of Individual Crops Per Hectare

The yields in quintals per hectare for more important crops are given in Table 17-18 for the whole country and for Slovakia. The yields of main grains--wheat, rye, barley, oats, and corn--surpassed the prewar level in 1948, after a fast recovery from the 1947 low. Between 1949 and 1954 the yields did not change much except due to seasonal factors from year to year. Since 1954 the yields have improved substantially. In 1961 the yields of main grains were between 34 and 52 per cent above the prewar level for the whole country. However, the yields in Slovakia increased on the average faster than for the whole country. By 1960 they were between 46 and 59 per cent above the prewar level, but the prewar yields in Slovakia were much lower than in the whole country.

The yields of other crops, i.e., colza and rape, sugar beets, potatoes, forage crops, and hay, however, remained below prewar level during most of the postwar years. The yields of crops, whose area-sown expanded greatly during the postwar years, remained the lowest, i.e. colza and rape and sugar beets, because of their extension into land less suitable for them than that on which they were previously grown.

In summary, although the yields per hectare of main grains increased during the postwar period above the prewar level, the yields of other crops decreased for the same period, resulting in a net decrease of crop production per unit of land for most of the postwar years. By 1961 the crop production per unit of land was a small amount (two per cent, using the 1936 price weights) above the prewar level. Thus, except for 1955-58 and 1960-61 the greatly increased use of fertilizers, mechanization, ²better varieties of seed, and withdrawal of some marginal land from cultivation failed, on the average, to yield greater crop production per unit of land.

B. Yields Per Livestock Unit

Productivity of livestock is measured here in terms of yields per unit of animal in a specified period. The average productivity of all livestock is not attempted here. Only the three most important series of animal products are examined, namely, milk yield per cow, meat yield per pig, and yield of eggs per hen. The indexes of yields for these series are to be found in Table 18.

²The total agricultural land decreased by 6 percent between 1934-38 and 1961 (Table 1, item 2).

These series indicate that production of milk, pig meat, and eggs, per head, remained during the whole postwar period very much below prewar level. There was some improvement of yields up to 1950, deterioration of yields from 1950 to 1954, and thereafter, until 1961, some increase of yields. For most of the postwar years the yields varied between 60 and 80 per cent of the prewar yields. In 1958-61 the yield of meat per pig was only 76 per cent, the yield of milk per cow 90 per cent, and the yield of eggs per hen 84 per cent of the prewar yields.

C. Production Per Unit of Capital

Production per unit of capital is defined as the ratio of total output to total capital input. "Capital" as defined here includes all assets engaged in productive activity in agriculture. It includes total agricultural land and improvement on land, all buildings and structures used for production purposes (excluding farmers' dwellings), all machinery, equipment and implements, all farm animals, fruit-trees, wood trees, work in progress (ripening crops and fodder crops awaiting consumption on the farm), and stocks of raw materials for use in production (fertilizers, purchased feed, fuel, and other inventories).

The value of all capital at 1936 prices is calculated in Table 19, items 1-6.³ Methods for valuation of capital are briefly outlined below. Value of agricultural land was obtained on the basis of average price per hectare in 1936 and the number of hectares for each year (Table 1, item 1). The average price was obtained by dividing the total value of agricultural land in 1936⁴ by the total number of hectares of agricultural land in 1934-38.

Value of machinery and equipment was calculated on the basis of available data on quantity and average 1936 prices paid by farmers for each specific kind of machinery and equipment.⁵ The value of buildings was estimated from the value of machinery and equipment on the basis of the ratios between value of machinery and value of buildings in 1934-38, 1946, and 1955.⁶ The data for missing years were obtained by interpolation.

Value of farm animals is the product of total number of animals, the average live weights, and the average prices received by farmers for the sales of animals (Table 6, items 1-10).

³For detailed calculations see Appendix E, Notes to Table A-24, and Appendix F, Notes to Table 19.

⁴Officially estimated market value of agricultural land (Jan Krblich, Survey of Czechoslovak Agriculture, Prague, 1947, p. 16).

⁵For detailed calculation see Appendix E, Notes to Table A-24.

⁶Zpravy zem., 1946, No. 2-4, p. 49; ibid., 1949, No. 1, p. 21; and Zem. ekon., 1958, No. 7, p. 466.

Table 19

VALUE OF CAPITAL, INDEXES OF OUTPUT, GROSS AND NET PRODUCT PER UNIT OF CAPITAL,
OUTPUT PER UNIT OF MACHINERY AND EQUIPMENT, AND INPUT AT 1936 PRICES*

Item	1934-38 average	1946	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961
A. VALUE OF CAPITAL (Billion crowns):																	
1. Agricultural land	76.5	74.3	73.3	74.6	74.4	74.1	74.0	73.7	73.5	71.2	71.9	73.1	72.8	72.4	72.9	72.6	72.3
2. Buildings	33.0	28.0	28.4	28.8	29.2	29.6	30.0	30.4	30.9	31.3	31.8	32.4	33.3	34.4	35.9	37.4	39.0
3. Machinery & equipment	7.1	8.2	8.3	8.3	8.4	8.6	8.9	9.2	8.7	9.2	9.6	10.2	10.4	10.2	10.4	11.0	12.4
4. Farm animals	12.6	11.6	10.7	10.5	11.7	12.5	12.8	13.2	12.9	12.5	12.7	12.9	12.8	12.8	13.0	13.2	13.3
5. Other capital	12.4	11.7	11.6	11.7	11.9	12.0	12.1	12.1	12.1	11.9	12.1	12.3	12.4	12.4	12.7	12.9	13.1
6. Total capital, 1-5	141.6	133.8	132.3	133.9	135.6	136.8	137.8	138.6	138.1	136.1	138.1	140.9	141.7	142.2	144.9	147.1	150.1
B. INDEX NUMBERS:																	
7. Total capital, 6	100.0	94.5	93.4	94.6	95.8	96.6	97.3	97.9	97.5	96.1	97.5	99.5	100.1	100.4	102.3	103.9	106.0
8. Machinery & equipment, 3	100.0	115.5	116.9	116.9	118.3	121.1	125.4	129.6	122.5	129.6	135.2	143.7	146.5	143.7	146.5	154.9	174.6
9. Output per unit of mach. & equip.	100.0	63.6	50.5	65.4	72.0	74.6	69.1	67.4	70.5	65.3	68.8	67.2	65.7	70.8	67.8	69.4	60.1
10. Output per unit of capital	100.0	77.8	63.2	80.8	88.9	93.5	89.1	89.2	88.6	88.0	95.4	97.1	96.1	101.3	97.1	103.5	99.1
11. Gross product per unit of capital	100.0	74.0	55.9	70.1	78.7	81.7	74.9	75.4	72.0	69.2	72.5	72.6	70.6	74.9	64.2	66.9	61.2
12. Net product per unit of capital	100.0	69.3	48.6	64.7	74.5	77.3	69.2	69.5	65.9	62.1	65.4	65.1	62.6	67.7	55.4	57.8	50.0
C. INPUT (Billion crowns):																	
13. Expenses & depreciation	4.5	4.6	4.8	5.9	6.0	6.6	7.0	7.0	7.4	7.8	8.9	9.4	9.7	10.0	11.3	12.4	13.1
14. Cost of all labor	10.0	9.6	9.0	9.4	9.0	8.6	8.0	7.7	7.7	7.9	8.0	7.9	7.6	7.3	6.8	6.1	5.8
15. Interest from capital	5.1	4.8	4.7	4.8	4.9	4.9	5.0	5.0	5.0	4.9	5.0	5.1	5.1	5.2	5.3	5.4	5.5
16. Total input, 13-15	19.6	19.0	18.5	20.1	19.9	20.1	20.0	19.7	20.1	20.6	21.9	22.4	22.4	22.5	23.4	23.9	24.4
17. Index of total input, 16	100.0	96.9	94.4	102.6	101.5	102.6	102.0	100.5	102.6	105.1	111.7	114.3	114.3	114.8	119.4	121.9	124.5
D. INDEXES OF VALUE OF BUILDINGS, MACHINERY AND LIVESTOCK FOR BREEDING:																	
18. Official figures, ^a 1948=100	..	..	..	100.0	102.2	105.3	108.4	109.7	111.4	115.1	130.0	138.0	149.0	161.0	177.0	193.0	211.0
19. Our figures, 1948=100	110.4	99.2	99.4	100.0	101.8	103.8	106.5	108.3	108.3	109.9	112.0	114.5	117.0	118.9	122.8	127.2	133.7
20. Excess of 18 over 19, %	..	..	..	-	0.4	1.4	1.8	1.3	2.9	4.7	16.0	20.9	27.0	35.0	44.0	52.0	58.0

a Stat. roc., 1958, and ibid., 1962, p. 46.

* For sources and explanatory notes, see Appendix F, Notes to Table 19.

Value of "other capital" (fruit trees, ripening crops, fodder, fertilizers, fuel, and other materials and inventories) for 1934-38 is available. For the postwar years it was assumed to amount to the same share of the total capital as in 1934-38. There is a strong correlation between the growth of other capital and total capital⁷ and, thus, this procedure seems to be justified. In 1934-38 the share of "other capital" amounted to 8.75 per cent of the total capital in agriculture.⁸

The official Czechoslovak sources give a measure of the value of capital in relative terms for the 1948-61 period. This measure includes only buildings, machinery and equipment, and livestock for breeding. This capital is valued at prices as of April 1, 1955, in terms of original cost (depreciation is ignored).⁹ The official data show an increase of 111 per cent in capital between 1948 and 1961 (Table 19, item 18); our independent calculation for comparable coverage of capital shows only 34 per cent increase for the same period (Table 19, item 19). The greater rate of growth in the official figures is probably due to use of a different method of valuation than we used. Since the official method of valuation is not known in detail we cannot accept the official figures. An additional reason for rejecting the official figures is that since 1948 the upward bias has been increasing (Table 19, item 20) due to rising rate of depreciation which was not taken into account.

Three measures of production per unit of capital were derived: output, gross products, and net product. All three measures are given in relatives (1934-38 = 100). They are calculated only in 1936 prices because the 1948 and 1956 prices of land are not available.

1. Index of Output Per Unit of Capital

This index (Table 19, item 10) is defined as the ratio of indexes of agricultural output at 1936 prices (Table 16, item 4) to the index of total value of capital at 1936 prices (Table 19, item 7).

The index of output per unit of capital shows that in all postwar years the output per unit of capital was well below the prewar level. It recovered from its low point of 63 in 1947 to reach 94 in 1950, but in subsequent years it decreased below 90 and remained low up to 1954. From 1955 to 1961 it increased gradually to the prewar level.

2. Indexes of Gross and Net Product Per Unit of Capital

The indexes of gross product and net product per unit of capital at 1936 prices are given in Table 19, items 11-12. Both indexes for the whole postwar

⁷Zpravy zem., 1946, No. 2-4; and ibid., 1949, No. 1, p. 21.

⁸Jan Krblich, op. cit., p. 16.

⁹Stat. roc., 1958, p. 32.

period remained very much below the prewar level. The index of net product decreased more than that of gross product. Valued in 1936 prices the net product per unit of capital was, in 1958-61, only 58 per cent of that in 1934-38. The reason for this sizeable decrease is to be found in the great increase of current operating expenses and depreciation in the postwar years which resulted in a considerable decline of the gross and net product (Table 16, items 7-18).

In summation, the output per unit of capital remained below 90 per cent of the prewar level up to 1954. From 1955 to 1961 it increased but did not attain the prewar level, except in 1958 and 1960. The gross product per unit of capital first increased from the low point of 56 per cent in 1947 to 82 per cent in 1950, then decreased to 70 per cent in 1954, again increased slightly in 1955-56 and then decreased in the subsequent years. The net product showed the pattern similar to the gross product in the postwar years, but its level was several per cent lower than that of the gross product during the whole period.

We examine the productivity of labor in the following chapter.

CHAPTER VII

PRODUCTIVITY OF LABOR AND OUTPUT-INPUT RATIO

In 1961 labor amounted to about one-fourth of all inputs into agriculture valued at 1936 prices. The quantity of output depends on the quantity of labor and the effectiveness of the labor unit. The effectiveness of the labor unit in agriculture is determined by the combination of several elements: the quality and quantity of land; the amount and quality of capital (buildings and machinery and equipment); the skill, intelligence, and training of all active persons in agriculture; and the quality of organization and management. As it is impossible to measure the contribution of any single element to the productivity of labor, causal changes in the productivity of labor can be established only in a general way.

One comprehensive measure of average productivity of all productive resources commonly used is the relationship of output to all inputs, i.e., output-input ratio.

In this chapter the following productivity measures are derived: output, gross product, and net product per man-year of labor and output-input ratio.

A. Index of Output per Man-Year

The indexes of output per man-year are ratios of indexes of agricultural output (Table 16, items 4-6) to the index of labor input expressed in man-years,¹ (Table 20, item 16). This definition is used for the derivation of indexes of output per man-year in Table 20, items 1-3. The index numbers of output per man-year are accurate measures of changes in the average unit productivity of labor when the output is constant in quality and composition, when the scope of measures of labor input is constant over time, and when the measures of labor input are identical in coverage with the measures of output to which they relate.²

The quality of Czechoslovak agricultural output did not change to any significant degree over the period under consideration. The composition of

¹The algebraic form of this productivity index is Q/M , where Q is the total agricultural output and M represents total amount of man-years of work.

²F. C. Mills, Productivity and Economic Progress, National Bureau of Economic Research, New York, 1952, pp. 24-25.

Table 20

INDEXES OF OUTPUT, GROSS PRODUCT, NET PRODUCT, MACHINERY AND EQUIPMENT AND TOTAL CAPITAL PER MAN YEAR OF LABOR AT 1936, 1948 AND 1956 PRICES, AND OUTPUT-INPUT RATIO AT 1936 PRICES*

<u>I t e m</u>	<u>1934-38</u> <u>average</u>	<u>1946</u>	<u>1947</u>	<u>1948</u>	<u>1949</u>	<u>1950</u>
1. Output per man year:						
at 1936 prices	100.0	77.9	66.4	82.6	96.1	106.5
2. " at 1948 "	100.0	75.3	66.6	79.8	93.9	107.3
3. " at 1956 "	100.0	76.3	67.0	80.3	94.0	106.4
4. Gross product per man						
year: at 1936 prices	100.0	74.0	58.7	71.7	85.0	93.1
5. " at 1948 "	100.0	72.5	61.5	73.0	87.3	99.6
6. " at 1956 "	100.0	74.3	62.9	74.1	88.2	99.8
7. Net product per man						
year: at 1936 prices	100.0	69.4	51.5	66.2	80.5	88.2
8. " at 1948 "	100.0	68.6	56.0	68.9	83.8	96.4
9. " at 1956 "	100.0	71.3	58.2	70.7	85.5	97.2
10. Machinery & equipment per						
man year: at 1936 prices	100.0	122.4	131.5	126.4	133.4	142.5
11. " at 1956 "	100.0	120.2	127.7	123.6	130.7	140.0
12. Capital input per man						
year: at 1936 prices	100.0	103.7	114.4	120.5	128.0	140.9
13. Total capital per man						
year: at 1936 prices	100.0	100.1	105.1	102.3	108.0	113.6
14. Output-input ratio:						
at 1936 prices ¹	1.05	0.79	0.65	0.78	0.88	0.93
15. Index of output-input						
ratio: at 1936 prices ²	100.0	77.3	62.9	76.6	86.3	92.0
16. Index of man years	100.0	94.4	88.9	92.5	88.7	85.0
17. Index of total crop &						
animal production per man						
year at 1956 prices,						
our figures	120.8	95.4	79.1	100.0	116.4	124.5
18. Index of total crop &						
animal production per man						
year at 1955/56 prices,						
official figures	..	..	..	100.0	116.3	130.8

*For sources and explanatory notes see Appendix F, Notes to Table 20.

¹Inputs were aggregated arithmettically.

²Inputs were aggregated geometrically.

	<u>1950</u>	<u>1951</u>	<u>1952</u>	<u>1953</u>	<u>1954</u>	<u>1955</u>	<u>1956</u>	<u>1957</u>	<u>1958</u>	<u>1959</u>	<u>1960</u>	<u>1961</u>
1.	106.2	109.2	114.1	112.5	107.9	116.5	123.5	127.8	139.9	148.4	177.7	184.5
2.	106.9	109.6	115.3	110.4	109.2	117.7	124.8	130.5	143.1	153.2	181.0	188.6
3.	106.1	109.9	114.8	110.4	109.6	117.8	124.4	129.7	142.8	151.3	180.3	187.9
4.	92.8	91.8	96.5	91.4	84.8	88.6	92.3	93.9	103.4	98.2	114.9	114.1
5.	99.3	99.5	104.8	97.4	95.7	101.3	106.1	110.2	121.9	123.3	142.8	145.2
6.	99.4	100.8	105.5	98.8	98.0	103.4	107.9	112.1	125.3	125.6	147.9	151.7
7.	87.9	84.8	88.9	83.7	76.1	79.9	82.9	83.3	93.5	84.8	99.3	93.1
8.	96.0	94.7	99.6	92.1	89.8	95.6	100.0	103.5	115.8	115.0	133.2	131.8
9.	96.8	96.8	101.2	94.5	93.2	98.9	102.9	106.5	120.9	119.3	141.0	141.7
10.	142.5	157.9	169.4	159.5	165.3	169.4	183.8	194.6	196.7	220.0	256.0	306.9
11.	140.0	153.9	166.0	154.9	158.9	166.0	179.7	190.8	188.9	208.8	238.7	284.5
12.	140.9	157.4	163.4	168.2	168.8	181.5	193.1	204.8	217.7	258.4	306.4	340.6
13.	113.6	122.5	128.0	127.0	122.6	122.2	127.2	132.9	138.1	152.9	171.7	186.3
14.	0.92	0.89	0.91	0.88	0.84	0.87	0.88	0.88	0.93	0.87	0.92	0.88
15.	91.7	90.0	92.1	90.3	87.5	92.9	95.7	96.7	104.0	103.2	115.8	114.4
16.	85.0	79.4	76.5	76.8	78.4	79.8	78.2	75.3	72.7	66.9	60.5	56.9
17.	124.3	136.0	136.6	138.6	132.5	146.0	153.2	155.4	165.3	177.8	207.3	216.5
18.	130.8	143.9	149.0	157.9	146.2	154.9	160.1	165.2	176.9	188.8	221.0	234.3

output did change, however, and this change (Table 9) may affect the measurement of labor's productivity. The measurement of labor input, in terms of man-years, would affect the accuracy of productivity measures if the hours worked per man-year changed over time.³ There are no data which would indicate any significant change in the scope of man-years in Czechoslovak agriculture between 1934 and 1938 and between 1946 and 1961.⁴

The coverage of labor input seems to be broadly identical with agricultural output because labor input includes all work done in agriculture during the calendar year expressed in terms of number of man-years.⁵ Thus, except for the changes in composition of output and some eventual changes in quality which might affect the accuracy of productivity measures over time, the index numbers (Table 20, items 1-3) derived from the ratio of agricultural outputs to labor inputs in terms of man-years seem to be accurate measures of changes in the average product per man-year.

The output per man-year derived in Table 20, items 1-3, is weighted in 1936, 1948, and 1956 price weights. Agricultural output per man-year increased by 63 per cent, 66 per cent, and 66 per cent as weighted in 1936, 1948, and 1956 price weights⁶ respectively, from 1934-38 through 1958-61. The effect of price weights on indexes of output per man-year is negligible. There are slight differences from year to year, of course, but the differences between indexes based on different price weights for the average of all years are less than 0.1 per cent.

The increase in output per man-year is attributable mainly to increased use of capital in the postwar period (Table 20, items 10-13). Increased mechanization reduced the man-years' requirement. The number of man-years spent on agriculture decreased by 36 per cent (Table 20, item 16) while the number of tractors⁷ increased several times from the prewar period to 1958-61.⁸ The quantity of capital stock (including land) per man-year increased by 62 per cent valued at 1936 prices from 1934-38 to 1958-61, or about the same relative increase as the output per man-year valued at 1936 prices for the same period (Table 20).

³This happened in many countries. In the United States the amount of hours worked per man-year decreased from 53 per week in 1914 to 47 in 1922 (ibid., p. 8).

⁴The age structure, however, shifted toward older age groups but it is not known whether this shift affected efficiency (Stat. Roc., 1958, p. 224).

⁵Ibid., p. 88.

⁶Weighted average prices received by farmers for the sale of their agricultural products. For more detail see Chapter II, C. 2.

⁷Index of number of tractors may be taken as an approximation of the index of mechanical power in agriculture.

⁸About one-eighth of the increase in tractors was used to replace animal power. However, the total mechanical and animal power increased from 1.4 million H.P. in 1930 to 4.8 million H.P. in 1958 (see Ceskoslovenska statistika, 1936, Vol. 115, Part IV, pp. 54;61; Zem. ekon., 1959, No. 5, p. VII; and

The increase in output per man-year since the war should be considered normal in view of the rapid expansion of mechanical power and implements. The input of all capital per man-year increased by 179 per cent and the value of machinery and equipment per man-year rose by 130-145 per cent (Table 20, items 10-11) from 1934-38 to 1958-61. The increased output per unit of labor was mainly the result of substituting capital for labor. Some of the factors affecting the output per unit of labor are discussed in the following chapter.

B. Indexes of Gross Product per Man Year

The indexes of gross product per man-year developed in this study (Table 20, items 4-6) are ratios of indexes of gross product valued at 1936, 1948, and 1956 prices (Table 16, items 10-12) to index of labor input in man-years (Table 20, item 16).⁹ The accuracy of this measure depends on the same factors as the measure of output per man-year discussed in the previous section.

The index of gross product per man-year is weighted in 1936, 1948, and 1956 price weights. The choice of price weights significantly affects the indexes. The indexes of gross product per man-year show a much smaller rate of increase (valued at 1948 prices) than the corresponding indexes of output per man-year. The increase of the former is approximately 33 per cent and that of the latter about 66 per cent from 1934-38 to 1958-61 because of the great increase in current operating expenses, while output has been lagging since the war years (Table 16, items 4-9).

C. Index of Net Product per Man-Year

The indexes of net product per man-year derived in this study (Table 20, items 7-9) are ratios of indexes of net product valued at 1936, 1948, and 1956 prices (Table 16, items 16-18) to the index of labor input in man-years (Table 20, item 16). The accuracy of this measure depends on the same factors as the measure of output per man-year already discussed in Section A of this chapter.

Again, the choice of price weights significantly affects the magnitudes of indexes. All indexes remained below the prewar level during the postwar years, except for 1956-61. The reasons for these differences have been discussed already in Chapter V, Section C.

The index of net product per man-year are lower than the two above discussed indexes. This behavior is parallel with the indexes of output, gross product, and net product (Table 16, items 4-6, 10-12, and 15-18). Thus, if the product is valued at either 1948 or 1956 prices, the contribution of

ibid., No. 3, p. II).

⁹ One man-year is equivalent to one adult person working full time in agriculture. This implies no change in scope of labor effort per person fully employed over time.

one man-year of work done in agriculture to the creation of net national product was smaller during almost all postwar years than in 1934-38. If the net product is valued at 1936 prices, the contribution of one man-year of work in agriculture to the creation of net national product was 10 per cent or more lower during all the postwar period except 1958 and 1960-61 than in 1934-38. The reasons for this large decrease were given above (see Section B).

The official Czechoslovak statistics include an index of "gross agricultural production per man-year" at 1955-56 prices which we compared with our index of crop and animal production (Table 20, items 17-18). The official index shows faster growth because the labor force working in machine-tractor stations is not included in the total labor force which was used to calculate the gross production per man year. Since the diversion of agricultural labor to machine-tractor stations was rapidly increasing,¹⁰ the labor force in the rest of agriculture was decreasing; thus, the official index of gross production per man-year has an upward bias.

D. Output-Input Ratio

The output-input ratio developed in this study (Table 20, item 14) is the relationship of agricultural output valued at 1936 prices (Table 10) to all production inputs used to produce that output, valued at 1936 prices (Table 19, item 16). This ratio is the measure of average productivity of all inputs used.¹¹ It measures aggregate productivity of all inputs together, although it does not show which particular input is used in excess or in too small quantities; and the magnitude of the residual left to any one input does not depend on overpricing or underpricing another input in relation to its actual productivity.

The ratios (Table 20, item 14) show the value of output for each crown of all annual inputs valued at 1936 prices received or paid by farmers.

The inputs consist of current operating expenses and depreciation (Table 13, item 31), interest from all capital engaged in agricultural production (Table 19, item 15), and total cost of labor (Table 19, item 14).

The rates of interest from value of capital¹² are those which were used to calculate the cost of capital in Czechoslovak agriculture.¹³ These interest rates are approximations to market interest rates.

¹⁰ Stat. roc., 1958, p. 223.

¹¹ The ratio is sometimes referred to as "total productivity" (see U.S. Dept. of Agriculture, Expansion of Agricultural Production, op. cit., p. 44.

¹² The capital consists of agricultural land, buildings, machinery and equipment, farm animals and other capital. For valuation of capital, see Appendix F, Notes to Table 19.

¹³ Cvancara, 1948, p. 511. The interest rates are given in Appendix F, Notes to Table 19.

The cost of labor was obtained by multiplying total number of man-years by average annual earnings. Figures on man-years include the work of all hired workers, farmers, and unpaid family helpers in agriculture. Average annual earnings include social insurance paid by employers per hired worker in agriculture in 1936. The result obtained in this way is the total cost of labor valued at 1936 "market" prices for labor¹⁴ (i.e., the cost of labor if all labor had to be hired in a labor market at prevailing wage rates in agriculture).

Thus, the output-input ratio indicates whether the agricultural sector as an economic enterprise sector would result in a "net loss" or a "net profit," if the prevailing "market" prices had to be paid for all inputs (including labor of farmers and their families). A ratio of more than 1.0 indicates that the value of output is greater than the value of all annual inputs and, therefore, the entrepreneurs or farmers would obtain a net profit as a return for entrepreneurial risk, if they were required to pay prevailing "market" prices for all inputs; conversely, a ratio of less than 1.0 indicates that the value of output is smaller than the value of all inputs used in a given period and, therefore, the entrepreneurs or farmers would suffer a net loss if they were required to pay prevailing "market" prices for all inputs used up in production.

The output-input ratios, derived in this study in terms of prevailing 1936 "market" prices, are given in Table 20, item 14. The ratio for 1934-38 indicates that had the agricultural entrepreneurs or farmers purchased all inputs for the 1934-38 period at prevailing 1936 "market" prices, they would have realized a net entrepreneurial profit amounting to 5 per cent of the value of all inputs for these years, i.e., the 1934-38 period.

After the war, however, the ratio remained below 0.9 for most years. This would indicate that had the farmers purchased all inputs at 1936 prices in postwar years, they would have realized a net entrepreneurial loss amounting to more than 10 per cent of the value of all inputs for most years.

There may be differences between the average quality of hired labor and that of the operator and unpaid family labor (the quality of labor of the operator is probably higher and that of the unpaid family labor is probably lower than the quality of hired labor). However, it is believed that the average difference between the quality of all hired labor and that of the operator including unpaid family labor was not so large as to invalidate our results. Part of the decline in the ratio during the early postwar years may be attributed to the deterioration of skills, and aging agricultural labor (Chap. VIII). However, during the latter years the technical skills were improved through agricultural education. It is to be noted that the relative share of female labor force remained unchanged.¹⁵

¹⁴See Table 19, item 14, and Appendix F, Notes to Table 19.

¹⁵Stat. roc., 1960, p. 90.

The output-input ratio expresses only those relationships which can be measured in money and the magnitude of the ratio depends on the valuation of factors and price weights used. It should be noted that the ratio, for example, omits the satisfaction which the farmers may derive from being their own employers, from the ownership of land and livestock, from the working conditions (fresh air, sun), from the opportunity to be bound constantly with nature. Furthermore, the cost of living for farmers is considerably lower than for nonfarmers. Farmers provide their food requirements largely from their own farms and, thus, they escape the high turnover tax on food which for some products (meat, butter) amounts to more than 100 per cent of the price paid to farmers by purchasing agencies. The farmers may obtain lower monetary returns than the nonfarmers but they may have similar standards of living. These differences are partly reflected in lower returns to labor of farmers.

It is impossible to calculate exactly the output-input ratio at 1948 or 1956 prices because, since the war, the market price of land has been unavailable. An estimate of the value of land was made on the assumption that its value changed in the same proportion as the prices of agricultural output, thus leaving the real value of land unchanged. This assumption seems to be plausible because the two most important factors affecting the value (price) of land--productivity of land and aggregate demand for agricultural products--appear not to have changed substantially since the prewar years. Prices of land in Bohemia and Moravia¹⁶ help to substantiate this assumption. On this basis the estimated output-input ratios would be: 1.37 in 1934-38 and 1.22 in 1957 if valued at 1948 prices and 1.02 in 1934-38 and 1.01 in 1957 if valued at 1956 prices.

The changes in the output-input ratio over time are of greater significance than the magnitude of the ratio in a given year. An increase in the ratio over a given period indicates a rise in "total productivity" due to one or a combination of several factors. A decrease in the ratio indicates a decline in "total productivity" again due to one or a combination of several factors. A part of the change in the ratio, however, is due to the "index number problem," i.e., changes in relative prices and quantities which introduce bias in this measure.¹⁷

The change in the ratio of an output index to an input, i.e., labor and tangible capital input index over time has been rather extensively used in

¹⁶ Zpravy zem., 1949, No. 1, pp. 20-21.

¹⁷ Vernon W. Ruttan, Technological Progress in the Meat Packing Industry 1917-47, U.S. Dept. of Agriculture, Washington, D.C., 1954, pp. 15-20. The author gives a concise analysis of bias in output-input ratio caused by changes of relative prices.

recent years to estimate changes in efficiency or technological progress in the economy and in individual industries.¹⁸

In this study, the changes in the output-input ratio, defined by the indexes weighted by the base period weights (1936 prices) as the lower limit and by the indexes weighted by the end period weights (1956 prices) as the upper limit, are intended to measure the changes in "total productivity," i.e., changes in output per unit of total measurable input (labor and tangible capital combined). Provided that the quality of output and of input (labor, capital, and land) included in the ratio does not change over time, the changes in "total productivity" result from: (1) changes of one, but more likely, of several intangible inputs, i.e., changes in basic science, technology, education, training, and economic organization; (2) the effects of all

¹⁸George J. Stigler, Trends in Output and Employment, New York, NBER, 1947, pp. 49-53; Glen T. Barton and Martin R. Cooper, "The Changing Efficiency of the American Economy," The Review of Economics and Statistics, Vol. XXXIV, August, 1952, pp. 214-32; Solomon Fabricant, Economic Progress and Economic Change, Thirty-fourth Annual Report, NBER, New York, May 1954; Solomon Fabricant, Basic Facts on Productivity Change, Occasional Paper No. 63, New York, NBER, 1959; Moses Abramovitz, "Resource and Output Trends in the United States Since 1870," American Economic Review, Vol. XLVI, Proceedings, May 1956; John W. Kendrick, "Productivity Trends: Capital and Labor," The Review of Economics and Statistics, Vol. XXXVIII, August, 1956, pp. 248-57; Vernon W. Ruttan, op. cit.; M. A. Copeland and E. M. Martin, "The Correction of Wealth and Income Estimates for Price Changes," Conference of Research in National Income and Wealth, Vol. II, New York, NBER, 1938, p. 127.

The estimates of changes in efficiency for agriculture include: Theodore W. Schultz, op. cit.; W. W. Cochrane, "Conceptualizing the Supply Function in Agriculture," Journal of Farm Economics, Vol. XXIX, May, 1947, pp. 383-408; Glen T. Barton and Martin Cooper, "Relation of Agricultural Production Inputs," The Review of Economics and Statistics, Vol. XXX, May, 1948, pp. 117-26; Clarence A. Moore, "Recent Developments in Brazilian Agriculture," Journal of Political Economy, Vol. LXIV, August, 1956, pp. 341-66; Theodore W. Schultz, "Reflections on Agricultural Production, Output, and Supply," Journal of Farm Economics, Vol. XXXVIII, August, 1956, pp. 748-62; Andrew G. Frank, "General Productivity in Soviet Agriculture and Industry: The Ukraine, 1928-55," The Journal of Political Economy, Vol. LXVI, December, 1958, pp. 498-515; Clifton R. Wharton, Jr., "A Case Study of the Economic Impact of Technical Assistance: Capital and Technology in the Agricultural Development of Minas Gerais, Brazil," Unpublished Doctoral Dissertation, Department of Economics, University of Chicago, August, 1958; Clarence A. Moore, "Agricultural Development in Mexico," Journal of Political Economy, Vol. LXIV, August, 1956, pp. 341-66; and U.S. Dept. of Agriculture, Technological Factors in the Expansion of Agricultural Production in West Europe, Foreign Agriculture Report No. 102, Washington, October, 1957, pp. 44-48.

other causes, i.e., increasing (decreasing) returns to scale of individual farms, economies resulting from increased specialization, nature of tax system, character of government subsidies, regulation of prices and all other government regulations and activities affecting the efficiency of the use of resources. All of these factors are related in a complex way and are integral determinants of the changes in "total productivity."¹⁹ Because of the insufficient data, it is impossible to measure the effect of any single factor (i.e., technology) on productivity changes. In addition, in agriculture the "total productivity" measure is affected by weather conditions, the effect of which, however, could be reduced by fitting a regression equation.

In Czechoslovak agriculture, sizeable changes in the output-input ratio ("total productivity") calculated in base period weights (1936 prices) have occurred from year to year (Table 20, item 15). In the calculation of this ratio the inputs were aggregated geometrically. Since the war, the index of the ratio was improving but it remained below the prewar level until 1957. Only in 1958-61 period has the ratio exceeded the prewar level by 4, 3, 16 and 14 per cent respectively. Because data were not available, the indexes of the ratios calculated in 1948 and 1956 prices could be estimated only for 1934-38 and 1957 when inputs were aggregated arithmetically. These estimates are given below for ratios inputs of which are aggregated arithmetically and also geometrically.

	<u>Index of Output-Input Ratio</u>	
	<u>1934-38</u>	<u>1957</u>
A. Inputs aggregated arithmetically:		
Calculated in 1936 prices	100	84
Calculated in 1948 prices	100	88
Calculated in 1956 prices	100	98
B. Inputs aggregated geometrically:		
Calculated in 1936 prices	100	97

Because of the bias inherent in the index number problem, which was discussed earlier, the above figures indicate that the "total productivity" between 1934-38 and 1957 either has not changed substantially, if one accepts the indexes weighted by the end period weights (1956 prices) as being true, or that it could not have decreased more than 16 per cent, if one accepts the indexes weighted by the base period weights (1936 prices) as being true. The true but unknown figure lies somewhere between these two limits. The ratio in which inputs were aggregated geometrically is similar to the arithmetically aggregated ratio weighted by the 1956 prices. The geometric aggregation is preferred by some authors. Despite the limitations, however, the output-input

¹⁹ Moses Abramowitz correctly characterizes productivity as a "measure of our ignorance" concerning the causes of economic growth and "an indication of where we need to concentrate our attention;" (See Resource and Output Trends in the United States Since 1870, NBER, Occasional Paper 52, 1956, p. 11).

ratio is a useful guide for the researcher who is examining the causes affecting the productivity changes.

Some of the more important factors, tangible and intangible, affecting changes in production and productivity are discussed in the following chapter.

CHAPTER VIII

FACTORS AFFECTING PRODUCTION AND PRODUCTIVITY

The preceding chapters have indicated some of the immediate "statistical" reasons for the behavior of production and productivity measures developed in this study.

This chapter is an effort to examine, in broader terms, some of more significant factors which affected Czechoslovak agricultural production and productivity during the postwar period. These factors can be divided into three groups: (1) War damage and weather conditions; (2) Production inputs (i.e., technology, capital, land, and labor); and (3) Organization of production and entrepreneurship. It is impossible to measure, in the present state of knowledge, the effect of each of these factors on production and productivity; we, therefore, examine their impact in general qualitative terms.

A. War and Weather Conditions

1. War Damage

World War II caused substantial destruction of the national wealth, and agriculture suffered particularly great damage. The war losses in agriculture (including forestry) were officially estimated at 44 billion crowns at 1947 prices, i.e., approximately one-tenth of the value of capital in agriculture in 1947.¹ Losses in livestock were particularly great. In 1945, as compared to prewar levels, the number of pigs was reduced by one-third, the number of cows by almost 20 per cent, and the number of poultry by one-half.² Damages to farm buildings, installations, and inventories were great, particularly in Slovakia. In consequence, immediate productive capacity was substantially diminished. In 1945 agricultural production amounted to only 56 per cent of the prewar level;³ livestock production, however, was much lower. War damage

¹Jan Krblich, Survey of Czechoslovak Agriculture, Prague, 1947, p. 30.

²Stat. roc., 1957, p. 133.

³U.N. Economic Commission for Europe, Economic Survey of Europe in 1948, Geneva, 1949, p. 11.

affected production and yields for several years (Tables 7 and 17). In other East European countries, however, war losses were much greater than in Czechoslovakia.⁴

2. Weather Conditions

Agricultural production is more affected by weather conditions than production in any other sector. Unfavorable weather in 1947 caused a sharp drop in crop production amounting to 32 per cent of the low 1946 level (Table 7). Severe drought also diminished the supply of feed, and this caused a large decrease in animal production in 1947 and 1948. The sharp decrease in our production series in 1952 was also due largely to bad weather (Table 11). Although war damage and bad weather affected greatly the production for certain years, the effect of such non-economic factors cannot, of course, be eliminated, though they introduce an exogenous element into the pure economic relationships described.

B. Production Inputs

The quality and quantity of different production inputs and the combination in which they are used are the main determinants of production and productivity. This section is devoted to some brief observations concerning changes in the more important inputs which affected production and productivity series for the postwar period. These are: land use, mechanization, improvement in methods of crop and animal production, capital investment, and labor.

1. Land Use

The total use of agricultural land decreased by about 5 per cent from 1934-38 to 1958-61 (Chapter I, Section B). The use of arable land, however, decreased by 9 per cent.⁵ In general, the less productive land was withdrawn; thus, the higher yields on the better land remaining in cultivation are slightly inflated.

One of the main factors which helped to increase the yields of grains and, to some extent, output per man, was the increased application of fertilizers. In general, less labor is needed for each additional unit of produce per each unit of fertilizer-enriched land, because increment in yield is proportionately much greater than the increment in man-hours attributable to fertilizer-spreading and harvesting work. In Czechoslovakia, the consumption of fertilizers increased greatly each year, and in 1961, it was six times higher than in prewar years (Table 14).

⁴Thad P. Alton, Polish Postwar Economy, New York, 1955, p. 32, and Jan Marczewski, Planification et croissance economique des democraties populaires, Vol. I, Paris, 1956, p. 121.

⁵Stat. roc., 1960, p. 219.

The increase in yields of main grains was undoubtedly due to increased application of fertilizer. This holds especially for Slovakia, where the increase in application of fertilizer was double the countrywide rate, and yields also increased at a higher rate (Table 18).

In Western Europe the use of fertilizer in 1956 was only about 78 per cent higher than in prewar years, but the yield of wheat had increased by 40 per cent, that of rye by 35 per cent, and that of barley by 30 per cent.⁶ Prewar yields and the consumption of fertilizer were generally lower in Czechoslovakia than in Western Europe. The yields of industrial crops (i.e., sugar beets, oil seed crops) remained under prewar levels although fertilizer was applied intensively to these crops. The reasons for this apparent inconsistency are discussed below in Section C.

2. Mechanization

Acute shortage of labor in postwar Czechoslovakia made necessary a greater use of labor-saving methods. As noted above in Chapter I, Section B. 2., human and animal power were, to a large degree, replaced by mechanical power. The number of tractors in use was increasing year by year, and by 1958-61, it exceeded the prewar level 15 times, and the volume of all machinery and equipment increased by 55 per cent. This development is reflected in higher output per man-year which increased by about 63-66 per cent from 1934-38 to 1958-61. The substitution of gasoline-consuming mechanical power for crop-consuming animal power also resulted in savings of labor and operating expenses. A number of Czechoslovak studies show that the cost of field work done by tractors is lower than the cost of the same operation done by horses. The cost of field work per hectare done by tractors on collective farms in 1956 was reported to be 37 per cent lower than comparable work done by horses. Use of tractors in transportation for small distances (up to 4 kilometers) did not show any significant difference in cost from that of horses.⁷

Agricultural mechanization probably had some favorable effect on yields and production since, in general, field work done by tractor-drawn machinery is of better quality than that done by horses (deep plowing, etc.).

Mechanization did not affect all parts of the agricultural sector evenly. Progress was concentrated in state and collective farms, while on privately-owned farms there were probably no advances toward mechanization. The allocation of machinery and equipment to various segments of agriculture seemed not to have been made in all instances according to the principle of equalizing the marginal productivity of machinery and equipment in all segments (i.e., state and collective farms versus private farms) of

⁶U.S. Dept. of Agriculture, Technological Factors in the Expansion of Agricultural Production in West Europe, Washington, D.C., 1957, pp. 11-13.

⁷Jan Cermak, "Prednosti traktoru proti konini," Za socialisticke zemedelstvi, 1957, No. 1, p. 22.

agriculture.⁸ This was reflected in the country's lower average increase in output per man-year than in Western Europe, despite the same rate of increase in mechanical power and approximately the same decrease in the agricultural labor force as in Western Europe.⁹ Between 1950 and 1956 the output per man-year increased by 17 per cent in Czechoslovakia (Table 20) and by 27 per cent in Western Europe¹⁰ (Chapter VII, Section A). Some of the reasons for a lower rate of increase in the output per man-year are discussed below in Section C.

3. Improvement in Methods of Crop and Animal Production

The adoption of better crop and livestock breeds increases the quantity produced per unit of input and, generally, the quality of products. Coupled with increased application of fertilizer (sub-section 1) modern farm-breeding methods affected some increments to the yields of main grains and animal products in Czechoslovakia. The increase in yield of milk per cow and eggs per hen in state and collective farms¹¹ was obtained chiefly by the increased supply of feed; however, the application of the lessons of modern genetics to development of higher breeds might have contributed to some extent to the increase in yields in the latter years only because the time required for improving the livestock breeds is fairly long.

Scientific research for advancement of technology in agriculture is highly developed in Czechoslovakia. In 1947 there were over 60 research institutes and 80 experimental research stations¹² carrying on experimentation in all branches of agricultural science. Dissemination of technological knowledge is made through rapidly increasing numbers of agricultural schools. The number of students at vocational and agricultural colleges increased from 9,915 in 1948-49 to 43,444 in 1961-62, and the number of agronomists trained

⁸Zem. ekon., 1959, No. 2, pp. 107-12; and Stat. obzor, 1956, No. 12, p. 539.

⁹For Czechoslovakia see Table 1; for Western Europe see U.S. Dept. of Agriculture, Expansion of Agricultural Production, op. cit., pp. IV-V. In both countries the mechanical power increased 8-10 times and the labor force decreased by 20-22 per cent between 1934-38 and 1956.

¹⁰Ibid., pp. 47-48.

¹¹The yield per cow increased by 25 per cent and the yield per hen by 67 per cent between 1952 and 1959 (Stat. roc., 1958, p. 226 and ibid., 1960, p. 254).

¹²Jan Krblich, op. cit., p. 27.

by agricultural colleges (graduate level) increased from 486 in 1953¹³ to 977 in 1958.¹⁴ This impressive growth in technological training does not seem to have significantly affected the overall output and output per unit of input (Tables 16, 18, and 20) although the state and collective farms seemed to have benefitted in some areas from the new technologies.¹⁵ Some of the reasons for the small returns to technology are discussed in Section C.

4. Volume of Investment

The total supply of fixed capital in agriculture is dependent upon the volume of investment. Increased investment in land improvement, new buildings, modern machinery and equipment and installations generally increases the efficiency of production and the output per man in particular. The value of gross new investment in agriculture increased greatly since 1948 (Table 21). However, most of the new investment was concentrated in state and collective farms; investment in machinery and equipment amounted to about one-third of the total. For private farmers the estimates show no new investment in new buildings. Figures for private farms' investment in machinery and equipment were not available; however, the total retail sales of agricultural machinery and equipment (Table 21), which include also the sales of small machinery and equipment to rapidly increasing state and collective farms, seem to indicate that the private farmer's investment in machinery and equipment probably decreased faster than his share in total agricultural land. Net disinvestment on privately-owned farms seems to be noticeable since 1950. In this year the gross investment in buildings on private farms amounted to 102 million crowns (at 1956 prices),¹⁶ and the depreciation charge was estimated at about 500 million crowns.¹⁷

There were many critics in the Czechoslovak press who declared that the productivity of new investment in state and collective farms was decreasing¹⁸ because of unnecessarily costly installations. However, in the long run a greater share of investment in larger units (state and collective farms) may prove to be more productive than in small private farms where an intensive use

¹³ Stat. roc., 1958, pp. 336 and 362, and ibid., 1962, pp. 406 and 414-15.

¹⁴ Zem. ekon., 1959, No. 6 (Supplement), p. VII.

¹⁵ Stat. roc., 1959, p. 234. The yields are somewhat higher in state and collective farms than in private farms in 1957-58 according to this source.

¹⁶ Stat. roc., 1957, p. 71 and ibid., 1958, p. 99.

¹⁷ 1.6 per cent of the estimated replacement value of buildings. Two-thirds of all buildings were estimated to be in private farms in 1950 (Table A-24, item 13).

¹⁸ Za socialisticke zemedelstvi, 1957, No. 12, p. 702. This source indicates that the productivity of new investment in stables decreased by 68.5 per cent between 1952 and 1956. See also Zem. ekon., 1959, No. 2, pp. 107-12 and Stat. obzor, 1956, No. 12, p. 539. In this latter source the author cites that one of the reasons for greater decrease in the share of agriculture in

Table 21

GROSS INVESTMENT IN AGRICULTURE AND FORESTRY, 1949-1961*
(Million crowns at constant 1959 prices)

<u>Item</u>	<u>1948</u>	<u>1949</u>	<u>1950</u>	<u>1951</u>	<u>1952</u>	<u>1953</u>	<u>1954</u>	<u>1955</u>	<u>1956</u>	<u>1957</u>	<u>1958</u>	<u>1959</u>	<u>1960</u>	<u>1961</u>
1. Total gross investment	375	849	1,142	1,800	1,842	2,372	2,338	3,187	4,043	4,300	5,216	6,399	7,156	7,709
2. Investment in machinery and equipment	42	312	387	462	209	355	605	1,106	1,397	1,414	1,670	1,968	2,541	3,004
3. Total gross investment in state farms	123	679	833	901	565	684	1,043	1,619	1,828	1,796	1,937	2,071	1,973	2,395
4. Investment in machinery & equipment in state farms	42	312	387	462	209	262	454	936	1,152	1,148	1,274	1,132	864	886
5. Total gross investment in collective farms	..	..	214	860	1,259	1,679	1,283	1,554	2,176	2,479	3,263	4,311	5,174	5,334
6. Investment in machinery & equipment in collective farms	..	..	..	..	..	..	151	170	245	266	396	836	1,677	2,118
7. Gross investment in buildings in private farms	252	170	95	39	18	9	12	14	39	25	16	17	9	-20
8. Value of retail sales of agricultural machinery & equipment	..	..	..	..	..	191	209	309	388	369	488	602	1,146	..
9. Index of total gross investment	100	226	305	480	491	633	623	850	1,078	1,147	1,391	1,706	1,908	2,056

*Sources: Stat. roc., 1958, p. 305, and ibid., 1962, pp. 128-139. Item 7 was obtained by subtracting items 3 and 5 from item 1. The total gross investment (item 1) does not include the investment in machinery and equipment in private farms.

of machinery is limited. The data in Table 23 seem to show a relative increase of gross production in collective and state farms in later years at the expense of the private farms' share. The period is too short, however, to make any definite conclusion.

5. Labor

As noted in Chapter I a major achievement in the postwar years was that the quantity of labor input decreased by 43 per cent from prewar to 1961, a decrease made possible by the substitution of capital for labor (Table 20, items 10-13). Here it is necessary to examine some aspects of the quality of labor inputs, a decisive factor affecting production and productivity in agriculture.

The skills of agricultural labor declined immediately after the war, since the skilled German farmers in Sudeten regions were replaced mostly by unskilled farm and non-farm workers who very often became operators of large farms.¹⁹ This had a negative effect on efficient operation in agriculture in early postwar years. Another factor which may have affected the productivity of labor to some degree was the rapidly aging labor force in agriculture. The average age of collective farmers in 1957 was 46 years.²⁰ On private farms the number of farmers above 60 years of age amounted to 35 per cent in 1961.

However, the number of graduates from agricultural schools increased greatly since 1948 (see above) which suggests at least a potential improvement in the quality of labor. In view of these counterbalancing factors, it is impossible to say whether, on the whole, the quality of labor changed significantly after prewar years.

According to findings in this study (Table 19, item 17), the total volume of all measurable inputs into agriculture increased by about 25 per cent between 1934-38 and 1961; some of the non-measurable inputs, i.e., technology and available knowledge, increased probably at least at the same rate as all measurable inputs. Yet the volume of output reached the prewar level only in 1958-61 and, except for the last seven years, it remained below 90 per cent of the prewar level. As a result, the "total productivity" (i.e., the output-input ratio) remained below the prewar level until 1958. One major factor remains to be considered as a possible cause of the deterioration in "total productivity:" organization of production and "entrepreneurship."

the total national income than in the total gross production was an excessively uneconomical use of capital in the State farms and in some collectives.

¹⁹V. Busek and N. Spulber, Czechoslovakia, op. cit., pp. 248-49.

²⁰Nova Mysl, 1957, No. 12, p. 1133, and Stat. roc., 1962, p. 252.

C. Organization of Production and Entrepreneurship

Organization of production in Czechoslovak agriculture has undergone basic changes since the war (Chapter I, Section 2). An hypothesis that this change in organization of production and entrepreneurship, among other factors, was responsible for the change in "total productivity" may be tested empirically by briefly comparing Czechoslovak postwar agricultural performance with that of West European countries having broadly similar natural and economic conditions in agriculture.

In prewar years, the general organization of production and technology in Czechoslovakia were similar to those in Western Europe. The impact of war on general levels of production and productivity also did not differ significantly.²¹ Since the war, the trend in major production inputs of these two areas has been almost parallel (Table 22).

Table 22

INDEXES OF THE VOLUME OF PRODUCTION INPUTS AND
OUTPUTS IN WESTERN EUROPEAN AND CZECHO-
SLOVAK AGRICULTURE BETWEEN
1934-38 AND 1956a*

Item	1934-38 Czechoslovakia and Western Europe	1 9 5 6			
		Czechoslovakia		Western Europe	
Agricultural land	100	96		97	
Labor force	100	78		80	
Tractors	100	836		1,002	
Fertilizers	100	409		178	
Horses	100	83		65	
Imported feed	100	436		190	
Output	100	97		125	
Output per man-year	100	124		156	
Output-input ratio	100 ^a	96		112	

^a1950 = 100.

*Sources: For Czechoslovakia: Tables 1, 13, 16 and 20; For Western Europe (includes Austria, Belgium, Denmark, France, West Germany, Ireland, Luxembourg, the Netherlands, Norway, Sweden, Switzerland, and the United Kingdom): U.S. Dept. of Agriculture, Expansion of Agricultural Production, op. cit., pp. IV-V and 46.

²¹U.N., ECE, Economic Survey of Europe in 1948, Geneva, 1949, p. 11.

The private enterprise system remained in Western European countries, while in Czechoslovakia it was replaced by a centrally-planned socialist system. The output in Western Europe increased by 25 per cent but in Czechoslovakia decreased by 3 per cent. "Total productivity" (i.e., output-input ratio) between 1950 and 1956 increased by 12 per cent in Western Europe but decreased by 4 per cent in Czechoslovakia (Table 22). Since there is one major variable of significance: organization of production including pricing and entrepreneurship, the relatively less efficient performance of the Czechoslovak agricultural sector is to be attributed largely to this change in the organization of production.²² Even if this "major variable" is an oversimplification of the complex political and social history of Czechoslovak agriculture since the war, this conclusion seems to be warranted by the evidence.

The increase in "total productivity" in Western Europe was chiefly the result of improved technology used on farms and, to a lesser extent, consolidation of small farms.²³ Similar results were obtained in other countries, for example, the United States.²⁴ In Czechoslovakia, however, the probable positive effect of improved technology seems to be more than offset by the negative effect of basic structural changes in the organization of production, changes imposed by the state which created crisis involved in rapid shift from private to socialized agriculture. These changes can be grouped under three main headings: (1) ownership of land; (2) entrepreneurship, and (3) rewards of agriculture.

1. Collectivization

The author has discussed briefly in Chapter I, Section B the rapid establishment of collective farms. The main economic motives of collectivization were to increase the agricultural production and the marketed share of output through the introduction of large scale farming which would permit an intensive mechanization and rationalization of agricultural production.²⁵ The mechanization was to increase the productivity of labor and to alleviate the

²² It may be that this variable is of a temporary nature. The inefficient management may be improved in the future and the incentives and cooperation of farmers may be increased by proper governmental policies in the future, i.e., by increasing the rewards of farmers and giving more independence to farmers in decision making. However, for the period under study this variable remains of major significance.

²³ U.N. ECE/FAO, European Agriculture, op. cit., pp. 42-43.

²⁴ U.S. Dept. of Agriculture, Expansion of Agricultural Production, op. cit., pp. 42-43.

²⁵ Statutes of collective farms adopted by the government, cited in Karol Svoboda, Preco a ako hospodarit podľa vzorových stanov, JRD, Bratislava, 1957, p. 419.

shortage of labor²⁶ resulting from the expulsion of German farmers and from a rapid shift of the agricultural labor force into industry. The rapid outflow of labor to industry was not offset sufficiently, however, by mechanization and, consequently, shortage of labor continued.

A higher output in the agricultural sector, which was one of the primary economic reasons for collectivization, did not materialize (Table 16). During the years 1951-61 the share of gross production of collective and state farms remained much lower than their respective shares of agricultural land. In 1960, for example (Table 23), their share in total agricultural land was 81 per cent, but they produced only 69 per cent of total gross production, because the production in collectives is less labor intensive (producing mainly crops) than in private farms. At the same time the private plots of collective farmers amounted to only 4.8 per cent of total agricultural land but they produced 21.2 per cent of total gross production. However, the production on small private plots is extremely labor intensive (i.e., gardening and livestock production) which results in high value of output per unit of land. The private farmers' share of gross production was also lower than their share of agricultural land but for most of the years relatively higher than the share of collectives and state farms because the labor intensive livestock production accounts for a larger share of the private farmers' total production.

The relative shares of marketings, however, present a somewhat different picture. The marketings of state farms and private plots represent a greater share than their share of agricultural land. The share of collective farms is roughly the same as the area of collectives, and the share of marketings of private farmers is substantially lower than their share of acreage. The reason for the low share of marketings of private farmers is because their households consume a large proportion of their produce (consumption in kind). The share of the state farms in marketings is large because none of their produce is consumed in kind by their households.

However, the relative changes of gross production and marketings over time in relation to acreage are also of interest. The percentage increase (decrease) in area, gross production and marketings between 1951-52 and 1960-61 in different branches is given below:

Percentage change between 1951-52 and 1960-61 in:	Agricultural Land	Gross Production	Marketings
State farms	51	54	26
Collectives	285	304	341
Plots of collective farmers	385	174	369
Private farms	-81	-87	-89

The above figures show an absolute decrease in marketings per unit of land in state farms. This would indicate a decreasing share of intensive

²⁶The shortage of labor is characterized by the inability of existing labor in agriculture to perform all important farm work, i.e., seeding, plowing, harvesting, and storing, at the appropriate time. The resultant and extensive harvesting losses accounted, to a large extent, for the decrease

Table 23

PERCENTAGE DISTRIBUTION OF AGRICULTURAL LAND, "GROSS PRODUCTION" AND MARKETINGS ACCORDING
TO DIFFERENT SECTORS, 1951-1961
(In 1955 prices)

Year	Agricultural lands ^a				"Gross production"				Marketings			
	State farms		Plots of collective farmers		State farms		Collective farms		Plots of collective farmers		State farms	
	13.3	14.8	0.9	70.9	10.9	10.7	6.3	72.1	17.7	10.6	1.7	70.0
1951	13.3	14.8	0.9	70.9	10.9	10.7	6.3	72.1	17.7	10.6	1.7	70.0
1952	13.2	17.3	1.1	68.3	11.5	16.1	8.0	64.4	17.5	17.3	2.2	63.0
1953	13.8	31.0	1.9	53.3	12.2	24.0	10.0	53.8	18.3	27.0	4.2	50.5
1954	14.1	27.9	1.8	56.2	12.8	21.1	11.3	54.8	19.8	25.8	4.1	50.3
1955	15.5	25.5	1.5	57.4	13.0	20.8	11.1	55.1	19.1	25.4	4.8	50.7
1956	15.9	25.4	1.6	57.1	12.2	24.1	11.9	51.8	18.2	28.8	5.3	47.7
1957	17.1	29.3	1.8	51.8	12.7	27.1	13.6	46.4	18.6	30.8	5.5	45.1
1958	17.6	45.1	3.2	34.1	13.7	40.5	20.5	25.3	18.4	44.8	11.4	25.4
1959	18.4	55.1	4.3	22.2	14.8	49.5	20.6	15.1	19.1	55.4	11.5	14.0
1960	19.6	61.0	4.8	14.6	16.2	52.6	21.2	10.0	21.6	59.1	10.8	8.5
1961	20.5	62.7	4.9	11.9	18.3	55.6	18.0	8.1	22.9	64.0	7.5	5.6

*Sources: Stat. roc., 1957, p. 112; *ibid.*, 1958, p.192; *ibid.*, 1961, pp. 236, 239; *ibid.*, 1962, pp. 226, 229. For 1951 and 1952 the distribution of agricultural land between collective farms and plots of collective farmers was made on the basis of the 1953 distribution because the data were not available separately.

^aPercentages do not add up to 100 because of rounding.

livestock production²⁷ and presumably an increasing share of their own produce used in further production on farms. The decreasing share of animal production points to the inability of the state farms to compete with the small private farms and plots in livestock production which requires skill, responsibility, and personal incentives. The collective farmers' absolute increase in production and marketing is attributed to an increasing share of livestock production and to increasing purchases of feed from other sectors (i.e., foreign sector).²⁸ The increasing share of animal production largely was due to the increasing transfer of livestock from private farms to collectives and to the improvement in methods of animal production. Although the gross production per unit of land decreased in plots of collective farmers, the volume of marketings increased at about the same rate as the acreage from 1951-52 to 1960-61.

The private farmers' gross production and marketings, however, decreased faster than their share of acreage. At least two factors seem to have contributed to this decline: (1) discriminatory pricing which lowered the income of private farmers and this, in turn, affected their purchasing power; (2) lack of farmers' incentives to improve their farms since collectivization was broadening. It should be noted that the decrease in gross production and marketings per unit of land in private farms occurred with a time lag, after the two collectivization movements in 1952 and again in 1956-58 (Table 23). The private farmers, unlike the farmers on collectives and state farms, did not receive any governmental subsidy. It is very likely that the volume of all inputs (labor, capital, and land) in collectives and state farms increased at a faster rate than their agricultural output which may have resulted in a less profitable operation, i.e., decreased returns to capital (Chapter VIII, section 3). As already indicated above, one of the reasons for the inability of collectives and state farms to obtain the proportionate increase in output from a given increase in inputs seem to lie within the scope of organization of production and entrepreneurship.

2. Organization of Production and Entrepreneurship in Collectives and State Farms

The success in agricultural production is dependent upon technical knowledge and skills which are specific to each particular area, i.e., knowledge of local climatic conditions, agrochemical conditions of soil, local hydrology, plant diseases, etc., all of which require long experience to attain. In a privately-owned family farm system, much of this specialized knowledge is passed from father to son who traditionally inherits the management of the farm and continues to improve agricultural methods in order to achieve the greatest possible output with the given amount of input.

in the output per acre. The decrease in total acreage that subsequently occurred was caused by the labor shortage (see F. Herlinger, "K otazce pracovnich sil v zemedelstvi," Za socialisticke zemedelstvi, 1957, No. 13, pp. 772-76 and ibid., No. 6, pp. 321-25).

²⁷Stat. roc., 1959, p. 261.

²⁸Ibid., p. 262; and Zah. obchod, 1958, No. 4, p. 6.

With the advent of collectivization and of the rapid expansion of the state farms, this traditional pattern was changed. The farmers, who were pressured into joining the collectives, or hired as workers in the state farms, had no authority to influence or to make decisions concerning the organization of production. Such decisions were made by managers whose selection was influenced by the Communist government with more emphasis on loyalty to the regime than on managerial ability.

This political element in the managerial aspect of farming resulted in inefficiencies in collective farm production. The inexperienced managers failed to recognize that state-prescribed farming plans disregarded the optimum cropping patterns for certain crops in specific areas. Instead the expansion of production was encouraged indiscriminately. One example of this inflexible policy of expansion was the case of industrial crops (i.e., oil seed crops and fibers), in which yields declined sharply during the period 1949-55,²⁹ instead of increasing as anticipated.

The central planning and the collectivization of land affected adversely the personal incentives of farmers. Private farmers lost their interest in improving their farms because of continuing governmental pressure for collectivization;³⁰ collective farmers already had lost their ownership of land, their economic independence, and had been reduced to the roles of laborers. The incentives of private farmers were further diminished by governmental manipulations of prices which affected their rewards. This is briefly discussed below.

3. Rewards of Farmers

Since World War II agricultural prices have been managed by the state authority. In 1949, discriminatory pricing was introduced mainly to achieve political ends of the Communist government rather than to achieve efficiency.

For agriculture, as a whole, however, the prices received by farmers for their products showed a favorable comparison between 1936, 1948, and 1956 (Table 24). From 1936 to 1956, these calculated indexes of prices received by farmers show greater increases than the indexes of prices paid for the production requisites (cost of materials and capital goods). The price ratio of prices received to prices paid by farmers increased substantially between 1936 and 1948. From 1948 to 1956 the ratio, however, increased only moderately.

A more meaningful measure of changes in the material position of farmers than the price ratio is the "real" returns per person fully engaged in agriculture. This was obtained by dividing the index of net income in current prices per fully engaged person in agriculture by the index of cost of living (item 15). The index shows that the "real" returns per permanently employed worker did not change significantly between 1936-38 and 1948, and that they

²⁹ Stat. roc., 1959, p. 233.

³⁰ Plan. hosp., 1958, No. 5, p. 341.

increased by some 12.6 per cent between 1948 and 1956. The accuracy of this index depends on the reliability of the cost of living index which was taken from official Czechoslovak sources. If the cost of living index is undervalued, then the "real" returns are correspondingly overvalued.

This would indicate that the terms of trade to farmers, not including the price of labor, improved, i.e., since the war the farmers have been able to buy a larger input of materials by selling a given bundle of output than before the war. However, the input side of this ratio omits the price of an important input, namely labor, and therefore it is not a complete measure of the terms of trade to farmers. Perhaps the change in the ratio indicates more accurately the change in terms of trade between agricultural products and production inputs of industrial origin including purchased feed from abroad. Therefore, the ratio is only a partial measure of changes in the material position of farmers since it does not include purchases of farmers' households and purchases of labor services (hired labor). Although the "real" returns to farmers in 1956 compare favorably with those in 1948 or 1934-38, they decreased sharply after 1948, probably reaching their lowest point during the period 1951-53, and, then, sharply began to recover to the prewar level which was reached in 1955-56. The pattern of money income and "real" returns to collective farmers and private farmers is shown below for the years for which data are available:³¹

<u>Item</u>	<u>1951</u>	<u>1953</u>	<u>1955</u>	<u>1956</u>
Average money income of working collective farmer, crowns	3,347	4,856	6,416	6,730
Average money income of working private farmer, crowns	1,735	2,285	3,960	4,409
Cost of living index of farmers, 1937 = 100		160.8	137.3	133.4
Index of "real returns" per collective farmer, 1956 = 100		59.9	92.6	100.0
Index of "real" returns per private farmer, 1956 = 100		43.0	87.3	100.0

The figures above show clearly that the money income of farmers was increasing rapidly for the years after 1953, while the cost of living was decreasing. However, the money income of private farmers was increasing more rapidly than that of collective farmers. The average money income of private farmers amounted to 47 per cent of that of collective farmers in 1953, but in 1956 it amounted to 65 per cent. The "real" returns to collective farmers in 1953 were 60 per cent of those in 1956.

The substantially lower level of income of private farmers as compared with that of collective farmers was chiefly a result of discriminatory multiple prices (low delivery prices, higher contractual prices, higher above-delivery prices, and free farmers' prices) directed toward private farmers in order to press them into joining collectives. As a result of this price discrimination, the limited income of private farmers has not permitted them

³¹Nova mysl, 1958, No. 7, p. 614; and Stat. roc., 1959, p. 387.

Table 24

PRICE INDEXES OF AGRICULTURAL OUTPUT AND CURRENT OPERATING EXPENSE, COST OF LIVING INDEX, PRICE RATIOS, AND "REAL" RETURNS PER MAN YEAR IN AGRICULTURE, 1936, 1948, AND 1956*

(1)	(2)	(3)	(4)
<u>I t e m</u>			
A. 1934-38 QUANTITY WEIGHTS:			
1. Prices of agricultural output	100.0	418.6	116.0
2. Prices of operating expenses	100.0	302.2	82.0
3. Price ratio: output/expenses (col. 1/col. 2)	100.0	138.5	141.5
B. 1948 QUANTITY WEIGHTS:			
4. Prices of agricultural output	100.0	404.3	112.8
5. Prices of operating expenses	100.0	295.5	77.3
6. Price ratio: output/expenses (col. 4/col. 5)	100.0	136.8	145.9
C. 1956 QUANTITY WEIGHTS:			
7. Prices of agricultural output	100.0	423.2	117.0
8. Prices of operating expenses	100.0	289.2	73.6
9. Price ratio: output/expenses	100.0	146.3	159.0
D. NET PRODUCT AND "REAL" RETURNS PER MAN YEAR IN AGRICULTURE:			
10. Net product at factor cost in current prices, million crowns	16,014.0 ^a	47,218.0	18,650.0
11. Total labor force in agriculture, 1000s	2,426.0 ^a	2,244.0	1,898.0
12. Net product at factor cost per man year, crowns (col. 10/col. 11)	6,601.0 ^a	21,041.9	9,826.1
13. Index of net product at factor cost per man year	100.0 ^a	318.8	148.9
14. Cost of living index, 1937 =100	100.0	322.1	133.4
15. Index of "real" returns per permanently employed (col. 13/col. 14)	100.0 ^a	99.0	111.6

*Sources: Items 1, 4 and 7 are from Table 15, items 1-3, cols. 2, 5, and 13, respectively, expressed in relatives (1936 equals 100); items 2, 5, and 8 are from Table 13, items 31-34, cols. 2, 5, and 13, respectively, expressed in relatives; item 10 is from Table 15, items 13, 14, and 15, cols. 2, 5 and 13, respectively, increased for 1948 by 1,199 million crowns of subsidy to state farms (see Stat. zav. uet., 1948, p. 23) and for 1956 by 2,260 million crowns of subsidy to state farms, collectives and machine-tractor stations (see National Income and Product of Czechoslovakia, 1955-56, Columbia Univ., MS 190); item 11 is from Table 1, item 11, cols. 2, 5, and 13, respectively; item 13 is item 19 expressed in relatives (current prices, 1934-38 equals 100); item 14 cols. 2. and 3 is from Stat. zpravodaj, 1949 No. 2, p. 75 (it refers to cost of living index of a worker's family in Prague); item 13, col. 4 (1937 equals 100) is from Stat. roc., 1958, p. 328 (it refers to cost of living of a sample of 340 farmers' households, using 1955 quantity weights).

^aRefers to the average of 1934-38 quantities valued at 1936 prices.

to purchase machinery, fertilizer, and other production requisites, even if they desired to improve the management of their farms. Although the inputs into whole agriculture rose substantially, their diversion from private to collective and state farms resulted in a less efficient allocation of productive resources and hence in a low over-all output to input ratios (Table 25).

During the second half of 1953 the government had recognized that if the agricultural production were to supply the growing population and the growing urban areas, the allocation of productive resources and manufactured consumer goods to agriculture had to be increased. Therefore, a new agricultural policy was initiated, differing from the earlier policy in three respects: first, a diminished pressure to collectivize; second, increased incomes in a variety of ways--by decreased prices of agricultural inputs, by increased prices of agricultural products, and by reduced taxation in cash and kind; third, a greatly increased volume of productive resources--fertilizers, feed imports, machinery and equipment, and building materials--was allocated to the whole of agriculture. The evolution of average prices of agricultural products and cost of living of farmers reflecting the distinct changes of the agricultural policy by the government is shown below:³²

<u>Item</u>	<u>1937</u>	<u>1953</u>	<u>1959</u>	<u>1960</u>	<u>1961</u>
1. Index of prices of agricultural products	100	89.8	139.1	168.5	170.7
2. Cost of living index of farmers	100	160.8	128.8	125.0	123.8
3. Price ratio: item 1/ item 2 (terms of trade of farmers)	100	55.8	108.0	134.8	137.9

This favorable development of price relationships had a perceptible effect on output in the subsequent years (Table 25). While in the 1949-54 period the output decreased in the subsequent years, 1954-61, the output increased at an average annual rate of 3 per cent. However, with renewed governmental pressure for collectivization after 1956, the favorable effects of the policy initiated in 1953 were partially reduced again by diminishing incentives of private farmers, and, therefore, decreasing their output per unit of land (Table 23). Because the production of collectives did not increase rapidly enough to compensate for the decrease in production of private farms, the production in the whole of agriculture became stagnant between 1958-61.³³

This brief review of some of the more significant measurable and non-measurable factors, which were responsible for the performance in production and productivity of Czechoslovak agriculture, should be considered a very tentative and a general outline. The changes in Czechoslovak agriculture cannot be explained solely with the tools of economics since these changes are the results of a complex interaction of economic, political, and sociological factors.

³² Ibid., pp. 387 and 389 and ibid., 1962, pp. 382 and 384.

³³ Ibid., pp. 219, 272-75; and Stat. obzor, 1960, No. 2 (Supplement).

Table 25

GROWTH RATES OF OUTPUT, INPUTS AND PRODUCTIVITY
IN CZECHOSLOVAK AGRICULTURE

Average Annual Percentage Rate of Increase or (-) Decrease

I t e m	P e r i o d		
	<u>1948-61</u>	<u>1949-54</u>	<u>1954-61</u>
OUTPUT:			
Crop and animal production	1.9	0.5	1.6
Output	2.4	-0.1	3.0
Gross product	1.8	-1.2	1.5
Net product	1.2	-1.6	1.4
INPUTS:			
Labor	-3.1	-2.8	-5.0
Operating expenses	7.5	5.9	8.3
Depreciation	2.4	2.0	2.8
Land	-0.2	-0.7	0.2
Total input	1.7	0.5	2.1
Capital input per man-year	7.4	5.7	10.6
Total capital per man-year	3.7	2.9	6.4
PRODUCTIVITY:			
Output per man-year	5.5	2.7	8.2
Gross product per man-year	4.3	1.6	6.7
Net product per man-year	4.2	1.2	6.5
Output per unit of capital	1.0	-0.6	2.0
Net product per unit of capital	-2.2	-4.0	-3.1
<u>Output per unit of all inputs</u>	0.4	-1.0	0.7

Sources: Calculated by fitting exponential curve to data
in Tables 16, 19, and 20.

CHAPTER IX

CONCLUSION

In the preceding pages the writer has measured and discussed the pattern of agricultural production and productivity of Czechoslovakia over the last two and half decades. The materials presented bear on questions central to the appraisal of an economic system in the field of agriculture.

One of the basic test of performance of any economic system is: How large a quantity of economically useful goods and services has it produced per unit of productive inputs (i.e., capital, land, and labor combined)? Has the system grown in effectiveness as a production mechanism? The findings of this study show that the present agricultural system in Czechoslovakia has not produced more goods per unit of all measurable inputs than the prewar agricultural system. There is an evidence that the output per unit of productive inputs has been less under the predominantly socialist system of agriculture for most of the postwar years, than under the prewar predominantly private agriculture (Table 20, items 14 and 15). In Western countries there are also many governmental controls and influences, but many of them, i.e., governmental research, extension service, education program and land reform, are responsible for the rise in productivity of agriculture.

However, an evaluation of postwar Czechoslovak agriculture can be made better by comparing it to agricultural performances of other countries, providing that the selected countries have somewhat similar natural and economic conditions. Since the farming areas in Western Europe and, to a slightly lesser extent, those in North America fulfill these requirements, agricultural outputs for these countries along with that for Czechoslovakia are given below:¹

<u>Country</u>	<u>Indexes of the Volume of Agricultural Output (1934-38 = 100)</u>	
	<u>Total Output</u> 1960-61	<u>Output per Capita</u> ² 1960-61
Czechoslovakia	108	112
Federal Republic of Germany	145	---
Western Europe	144	126
North America	159	109

¹FAO-Mon. Bul., 1959, No. 7, p. 20; FAO-Yearbook, 1958, pp. 27-28; *ibid.*, 1961, pp. 27-28; Statistisches Jahrbuch für die Bundes Republik Deutschland, 1957, Statistisches Bundesamt, Wiesbaden, 1957, p. 147; Stat. roc., 1958, p. 47; and Table 16.

²It refers to the total population.

The figures show that the total output rose substantially in Western Europe and in North America, but in Czechoslovakia the total output did not increase substantially. Similarly, output per capita in Western Europe increased at a substantially greater rate. The 12 per cent increase of Czechoslovak output per capita was due partly to the transfer of German-speaking people out of border regions into Germany.

The volume of measurable inputs of agriculture in Czechoslovakia and in Western Europe increased approximately by the same rate. Their labor force decreased by more than one-third. Other material inputs in Czechoslovakia increased by 78 per cent from 1934-38 to 1958-61 (Tables 19 and 25). In the United States, however, the man-hours of work in agriculture decreased by 50 per cent between 1937 and 1959³ and the volume of total inputs (labor and capital) increased by 7 per cent in the same period.

The output per unit of all measurable inputs (labor and capital) increased by 12 per cent in Western Europe from 1950 to 1956 (Table 22), and in the United States it increased by 64 per cent from 1937 to 1957.⁴ In Czechoslovakia, however, there seems to have been no increase until 1958 (Tables 20 and 22). The efficiency of production in Western Europe and the United States was achieved mainly by technological change. In Czechoslovakia the effect of technological progress was probably offset by other factors, i.e., pricing, lack of incentives on the part of farmers, their passive resistance toward the political system, and the difficulty of applying central planning to a sector whose performance depends heavily on weather conditions (Chapter VIII). While the output per man-year increased by about 63-66 per cent between 1934-38 and 1958-61, the increased output per unit of labor was the result of substituting capital for labor. While the input of all capital per man-year increased by 179 per cent, the volume of machinery and equipment per man-year rose by 130-145 per cent (Table 20, items 10-12 and Table 25).

Comparison of the results of Czechoslovak agriculture to those of other socialist East European countries also may help in evaluating the Czechoslovak agriculture. The preliminary measures of output, operating expenses, and net product in East European countries are given in Table 26.

³U.S. Dept. of Agriculture, Agricultural Outlook Charts '60, p. 50.

⁴John W. Kendrick, "Productivity Trends in Agriculture and Industry," Journal of Farm Economics, Vol. XL, December, 1958, p. 1560.

Table 26

OUTPUT, EXPENSES AND NET PRODUCT OF AGRICULTURE
IN EAST EUROPEAN COUNTRIES⁵

OUTPUT:	1934-38	1950-51	1954-55	1956-57
Czechoslovakia at 1956 prices	100	89	86	98
Poland (postwar territory) at 1956 prices	100	102	102	119
Hungary (postwar territory) at 1955 prices	100	96	89	106
Bulgaria (postwar territory) at 1939 prices	100	104	110	116
U.S.S.R. (not adjusted for territorial changes) at 1925-29 prices	100 ^a	117	139	158 ^a
U.S.S.R., output per man-day	100 ^a	110	136	150 ^a
CURRENT OPERATING EXPENSES:				
Czechoslovakia at 1956 prices	100	165	191	250
Poland " " "	100	117	122	135
Hungary " 1955 "	100	95	103	124
Bulgaria " 1939 "	100	129	183	212
NET PRODUCT:				
Czechoslovakia at 1956 prices	100	80	74	82
Poland " " "	100	95	99	116 ^b
Hungary " 1949 "	100 ^b	103	99	98 ^b
Bulgaria " 1939 "	100	96	84	81

As in the case of Western Europe and the United States previously discussed, Czechoslovak results do not compare favorably with other East European countries. Poland, Hungary, and Bulgaria all show better results. In relation to other countries, the measures for Bulgaria are overestimated because valuation in prewar prices results in higher estimates than valuation in postwar prices.

⁵Czechoslovakia: Table 16; Bulgaria: Khristo Popov, Satsialistichesko razshireno vuzproizvodstvo, Nauka i izkustvo, Sophia, 1959, pp. 159-60; Soviet Union: Arcadius Kahan, "Changes in Labor Inputs in Soviet Agriculture," Journal of Political Economy, Vol. LXVII, October, 1959, p. 460; Poland: calculated from Maly rocznik statystyczny, Vols. 1935-39 and Rocznik statystyczny, Vols. 1947-50 and 1955-59, Warsaw; Hungary: calculated from Annuaire statistique hongrois, Vols. 1935-38; Statisztikai Evkonyv, 1949-55; and Nepgazdasagi realjovedelmek, 1956, Central Statistical Bureau, Budapest.

^aThe figures refer to 1936-38 and 1955-56, respectively.

^bThe figures refer to 1938 and 1955-56, respectively.

The Russian results are difficult to appraise because the prewar figures refer to a smaller territory. However, Soviet agriculture has grown rapidly during the 1954-60 period. An adjustment of the postwar figures to the comparable prewar territory (1938) on the basis of the Jasny's calculation of output in 1940 would result in about a 16 per cent decrease of the postwar output. The adjusted index of output for the prewar territory in selected years is given below:⁶

<u>Period</u>	<u>Index</u>
1926-29	100
1936-38	102
1950-51	100
1954-55	119
1955-56	135

The stagnation of the Soviet agricultural output and output per unit of labor between 1926-29 and 1953 was mainly due to (1) the low level of investment⁷ in relation to great losses of capital stock during the early period of collectivization; (2) the uneven mechanization of individual operations; (3) the lack of incentives resulting from low real income of collective farmers; (4) the highly centralized, inefficient decision-making; (5) the effect of the crisis involved in the rapid shift from private farming to collectives in the early 1930's; and (6) the disastrous effect of the war damage.

In Czechoslovakia, however, the volume of physical capital and other production inputs increased greatly since the advent of collectivization in 1949 (Tables 13 and 19, and 25). The collectivization drive was not as rapid as in the Soviet Union, and the war damage to agriculture was much smaller than in the U.S.S.R. Thus the economic conditions were more favorable in Czechoslovakia during the 1950's than in the Soviet Union during the early 1930's and, therefore, these two periods cannot be compared. In the Soviet Union the main factors in the stagnation in agriculture were the low material inputs and low incomes of collective farmers resulting in lack of incentives.

⁶The figures are from Arcadius Kahan, op. cit. The postwar figures were adjusted downward by 16 per cent, i.e., the estimated share of the output obtained on the enlarged territory. This share was obtained on the basis of the Jasny's figures for 1940. In that year the Russian agricultural output based on pre-1939 territory amounted to 17.8 billion rubles at 1926-27 prices (see Naum Jasny, The Soviet Economy during the Plan Era, Stanford, 1951, p. 17).

⁷Between 1929 and 1952 the agriculture's share in total state investment amounted to 10.6 per cent (see Lazar Volin, Foreign Agriculture, October, 1953, p. 175), but the share of income of households from agriculture exceeded 20 per cent of the total (see Jasny, op. cit., p. 35, and O. Hoeffding and N. Nimitz, Soviet National Income and Product, 1949-1955, The Rand Corporation, 1959, p. 5).

In Czechoslovakia, however, one of the most important factors responsible for the stagnation seems to be of sociological origin, i.e., passive resistance of farmers in cooperating with the Communist system manifested through lack of incentives and reflected in the inefficient operation of farming business.

As the result of historical development of rural life, the Czechoslovak farmer has a deep rooted sense of private ownership, individual freedom, religious feeling, and family-farming (Chapter I). All these attributes were challenged by the Communist government through the imposition of the socialist system of farming. Most of the farmers reacted by passively resisting this new system which caused a crisis in agriculture. It remains to be seen whether the passive resistance of farmers will be broken in the future. During the 1950's, however, it was one of the major factors negatively affecting Czechoslovak agricultural output and net product.

Agricultural output and net product of other East European countries particularly show substantial improvement from 1955 to 1957. However, this might be explained by changes in governmental policies which provided a larger share of investment to agriculture, increase in prices of agricultural products, and partial or total abandonment of discriminatory pricing. The most significant change in governmental policies was the status of the collective farmer,⁸ who was permitted to leave the collective farm if he wished. The majority of these farmers, given their choice, left. By the end of June, 1957 the share of agricultural land of Poland in collectives had fallen to 1.2 per cent⁹ and of Hungary, it had fallen from 22.6 per cent in 1952 to 8.5 per cent in 1956.¹⁰ The increased incentives of private farmers seemed to be one of the main reasons (the others being higher prices of products, lower prices of production requisites) for rapidly increasing output.

Why was collectivization resumed in Czechoslovakia in 1956, when it had been demonstrated not only in Czechoslovakia, but in other countries as well, between 1954-56, that farm output increased more rapidly without collectives? The Czechoslovak planners believed that, in the long run, the collectives would be more productive than the small private farms. They probably anticipated a temporary decrease in the output because of the private farmers' passive resistance to cooperate with the socialist system. The deciding factor in the government's resumption of collectivization in Czechoslovakia besides Soviet pressure may have been that the country's economy could afford "temporary" difficulties, even a decrease in agricultural output, without seriously impairing the fulfillment of industrial plans.

⁸For an interesting analysis of changes in agricultural policies see Alexander Erlich, "The Polish Economy after October, 1956: Background and Outlook," American Economic Review, Vol. XLIX, May, 1959, pp. 94-112; also Lazar Volin, "Soviet Agriculture under Khrushchev," ibid., pp. 15-32.

⁹Maly Rocznik Statystyczny, 1958, Warsaw, 1958, p. 45.

¹⁰Statisztikai evkonyv, 1957, Budapest, 1959, p. 175.

In 1961, the contribution of agriculture to the national income amounted only to 13 per cent.¹¹ The relatively strong position of Czechoslovak industry on the world market makes it possible and, for some products, even advantageous for the country to exchange the industrial goods for agricultural products by means of international trade (comparative advantage). Although increase in domestic agricultural output is highly desirable to achieve self-sufficiency in food supply, it is not, however, an absolute prerequisite for industrial expansion of Czechoslovakia.

In other East European countries which are not yet highly industrialized e.g., Poland, where the industrialization is dependent upon the domestic supply of food and agricultural raw materials, forced collectivization would probably result in serious impairment of industrial expansion. Also, the standards of living would decrease and eventual political unrest of farmers and workers might result (e.g., upheaval in Poland and in Hungary during 1956). Although economic and political factors have resulted in different decisions for different countries at different times, the final aim of planners in all East European countries is the collectivization of agriculture. By 1963, over 90 per cent of agricultural land in all East European countries, except Poland, was socialized. Capitalism in agriculture and socialism in industry are incompatible with the planners' concept of socialism.

On the whole, the stagnation of agricultural output in Czechoslovakia did not impair the food supply and the living standards of the population. There are indications that per capita consumption of food is higher than in the prewar period because the total population in 1961 was about 4 per cent smaller than in 1937,¹² but agricultural output was slightly above the prewar level. Furthermore, before the war exports of food from Czechoslovakia approximately balanced the imports, while after the war the country became a net importer of agricultural products (butter, fat, eggs, wheat, rye, fruits). Between 1948 and 1957, the net imports of food rose by 22 per cent (from 1,350 million crowns to 1,646 million crowns).¹³ The rapidly increasing exports of capital goods to less developed countries and to the Soviet Union permitted an increase in food imports.

From the above analysis it seems that the comparative advantage of Czechoslovak economy lies more in industry than in agriculture, causing a rapid decrease of the labor force in agriculture (43 per cent decline between 1934-38 and 1961). Labor was attracted by higher earnings of industry and, at the same time, discouraged from remaining in agriculture because of the discriminatory governmental policy toward private farmers.

It may be noted that the performance of the economy in sectors other than agriculture has been more satisfactory since the war, and it seems that the lag in agriculture has not seriously impaired the growth in other sectors.

¹¹Stat. roc., 1962, p. 43.

¹²Ibid., p. 84.

¹³Zah. obchod, 1958, No. 4, p. 6.

The official data are shown in Table 27.

Table 27

GROWTH OF DIFFERENT SECTORS OF THE CZECHOSLOVAK ECONOMY¹⁴
(In constant 1955 prices)

<u>Item</u>	<u>1948</u>	<u>1953</u>	<u>1955</u>	<u>1957</u>	<u>1959</u>	<u>1961</u>
Industrial production	100	193	224	270	333	406
Industrial production (according to U.N. methodology) ¹⁵	100	160	176	204	---	---
National income: Industry	100	148	170	200	238	285
Construction	100	214	252	319	392	454
Agriculture and forestry	100	127	123	119	109	110
Other sectors	100	237	324	326	336	353
Total income	100	155	178	203	232	267

It is known that the above data have an upward bias as is shown by the large difference between the official index of industrial production and the index computed by the United Nations method. Further, the official data exclude all "non-productive" services and therefore overestimate the growth. Even if we accept that the growth was only one-half of the indicated figures, the performance would still be satisfactory since Czechoslovakia was already one of the ten most industrialized nations in Europe before the war¹⁶ and her industrial capacity further increased during the war.

According to these findings it would seem that, for the present, industrial expansion in Czechoslovakia is more favorable than for agriculture. This, of course, does not mean that agriculture cannot expand and will not expand. The planners and leaders of Czechoslovakia desire very much to increase agricultural output since this will decrease the country's dependence on food from abroad and will increase the country's per capita food supply.

What are some of the future prospects? Forecasts of economic development in general and of a socialist system, in particular, are hazardous whether based on historical analogy, trends, or purely on intuition. However, brief reference can be made concerning the recent developments.

¹⁴Stat. roc., 1962, pp. 24, 42, and ibid., 1959, pp. 18, 35.

¹⁵George J. Staller, "Czechoslovak Industrial Production, 1947-57," Cornell University, 1959 (unpublished doctoral dissertation), p. 143.

¹⁶According to League of Nations division cited by Gregor Lazarcik, Le commerce en matiere agricole entre l'Europe de l'Ouest et l'Europe de l'Est, Paris, 1959, p. 11.

In recent years Communist-bloc leaders have recognized the failure of their policies in agriculture. Major steps have been taken towards decentralization of the organization of production and relaxation of price discrimination. In 1958 the Soviet Union abolished machine-tractor stations and obligatory deliveries at low prices fixed by the state.¹⁷ In Czechoslovakia the liquidation of machine-tractor stations was begun at the beginning of 1959.¹⁸ Their machinery and equipment were sold to collectives. The discriminatory multiple price system was repealed in 1960 and uniform higher prices (25 per cent higher in 1960-61 than in 1959) have been since paid to farmers.¹⁹ Planning is being regionally decentralized with management receiving greater freedom concerning detailed decisions of production. However, to collectivize all agricultural land remains a firm objective of the state's agricultural policy. By April 1962, already 90 per cent of all agricultural land was socialized.²⁰ The government is putting more emphasis on increasing the productive capacity by channeling more resources into agriculture. In 1961 the gross investment in agriculture amounted to 7.7 billion crowns or almost one-half of that in industry.²¹ The Third Five-Year Plan for agriculture provides for a 40 per cent increase in gross production between 1961 and 1965. It remains to be seen whether it will be fulfilled. It should be noted that the Second Five-Year Plan (1956-60) provided for a 30 per cent increase, but the actual increase has amounted only to 10 per cent.²² Another significant provision of the third plan is to increase the "real" income of collective farmers by 35 per cent through decreasing costs and increasing production.²³

Whatever the future performance in Czechoslovak agriculture may be, our findings show that up to now, under the Communist system of government, the agricultural sector has been producing less efficiently than agricultural sectors under predominantly private enterprise systems in other countries (Chapter VIII). Even if in the future the socialist system should produce more effectively, how will the increased productive resources be used? Will they actually be used for the welfare of the people? The answers to these questions lie beyond the realm of economics and raise moral and political issues outside the scope of this paper.

¹⁷ECE-Survey, 1958, Chapter I, p. 17.

¹⁸Plan. hosp., 1959, No. 7-8, pp. 521-22.

¹⁹Stat. roc., 1962, p. 384.

²⁰Ibid., p. 231.

²¹Ibid., 1962, p. 128.

²²Ibid., p. 220.

²³Plan. hosp., 1960, p. 20.

ABBREVIATIONS OF MOST FREQUENTLY USED SOURCES

Baca	<u>Za dalsi rozvoj socialisticke zemedelske družstevni velkovyroby v lidove demokraticke CSR.</u>
Cen. zpravy	<u>Cenove Zpravy Statního uradu statistického.</u>
Cvancara	Frantisek Cvancara: <u>Zemedelska vyroba v cislech</u>
Deset let	<u>Deset let rozvoje narodního hospodarstvi a kultury Ceskoslovenske republiky, . . .</u>
Dolansky	Jaromir Dolansky: <u>Vyklad k rozpoctu na rok, . . .</u>
ECE-Bulletin	<u>Economic Bulletin for Europe</u>
ECE-Survey	<u>Economic Survey of Europe</u>
Ekon. cas.	<u>Economicky casopis</u>
FAO-Mon. Bul.	<u>Monthly Bulletin of Agricultural Economics and Statistics</u>
FAO-Yearbook	<u>Yearbook of Food and Agricultural Statistics</u>
Fin. uver	<u>Finance a uver</u>
Nat. Bank Bul.	<u>National Bank of Czechoslovakia Bulletin</u>
Plan. hosp.	<u>Planovane hospodarstvi</u>
Prakt. prir.	<u>Prakticka prirucka pro zemedelce, statni zemedelske nakladatelstvi</u>
Prir. zoot.	<u>Prirucka pro zootechniky</u>
Prubeh	<u>Prubeh plneni hospodarskeho planu na rok, . . .</u>
Prum. zpravy	<u>Prumyslove zpravy statního uradu statistického</u>
Sb. zak.	<u>Sbirka zakonu republiky Ceskoslovenske</u>
Sb. zak. nar.	<u>Sbirka zakonu a narizeni republiky Ceskoslovenske</u>
Stat. Bul.	<u>Statistical Bulletin of Czechoslovakia</u>

Stat. Digest	<u>Statistical Digest of the Czechoslovak Republic</u>
Stat. obzor	<u>Statistický obzor</u>
Stat. prir. Slov.	<u>Statistická priručka Slovenska</u>
Stat. roc.	<u>Statistická ročenka republiky československé, . . .</u>
Stat. zav. ucet	<u>Statní závěrečný účet republiky Československé</u>
Stat. zpravodaj	<u>Statistický Zpravodaj</u>
Stat. zpravy	<u>Statistické zpravy</u>
Svoboda	<u>Prečo a ako hospodariť podľa vzorových stanov JRD</u>
Tesn. zpravy	<u>Tesnopisecké zpravy o schůzích Národního shromáždění republiky Československé</u>
Ur. list	<u>Úřední list republiky Československé</u>
Ved. prace	<u>Vědecké práce Vyzkumného ústavu zemědělské ekonomiky CSAZV v Praze</u>
Zah. obchod	<u>Měsíční přehled zahraničního obchodu</u> , also <u>Zahranicní obchod</u>
Zakl. otaz. rastl.	S. Durina, R. Kršiak, and F. Hrosso: <u>Základné Otázky rastlinnej výroby</u>
Zem. ekon.	<u>Sborník Československé akademie zemědělských věd: zemědělská ekonomika</u>
Zem. noviny	<u>Zemědělské noviny</u>
Zpravy	<u>Zpravy statního úřadu statistického</u>
Zpravy zem	<u>Zpravy zemědělského ústavu účetnicko-správoedného republiky Československé</u>

SIGNS AND ABBREVIATIONS

. .	Means that data is not available or not pertinent
--	Means that data is nil or negligible
ha.	Hectares
K.W.H.	Kilowatt-hour
Ton	Metric ton (1,000 kilograms)
Crowns	Czechoslovak crowns

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